ECONOMIC GEOGRAPHY

VOL. 8 OCTOBER, 1932 No. 4

AGRICULTURAL REGIONS OF NORTH AMERICA

PART X—THE GRAZING AND IRRIGATED CROPS REGION—*Continued*

Oliver E. Baker

THE ROCKY MOUNTAIN DISTRICTS

Passing now to the headwaters section of the Rio Grande (reserving the intervening districts for description in connection with the Mexican Highland area), we come to a land famous for its Indian Pueblos and its ancient agriculture. From near Santa Fé northward the Rio Grande flows between two mountain ranges, the Sangre de Cristo on the east and the Jemez and San Juan mountains on the west. This mountain valley has two very distinct sections, a southern basin extending nearly to the Colorado line, dissected by canyons and with several tributary valleys and mesas, the remnants of a lava flow, and to the north, in Colorado, that extraordinary undissected and almost level mountain basin called the San Luis Valley. In the Rio Grande Valley and tributaries in the New Mexico section north and west of Sante Fé there were over 100,000 acres of irrigated land in 1929, a half of which, apparently, was used for pasture. The principal crops were alfalfa (15,000 acres), corn and wheat (each 7,500 acres), and potatoes (2,500 acres). Owing to the high elevation, 6,000 to 8,000 feet, spring wheat mostly is grown and the corn is of hardy varieties. There are several thousand acres also of timothy hay, other tame grasses, and wild hay. The hay is needed for winter feed for the 30,000 cattle and half as many horses.

The parallel arrangement of mountain ranges in northern New Mexico continues across Colorado, giving rise to several high basins and valleys, and in the northern Rockies the ranges become numerous, with many intervening valleys. The San Luis Valley in southern Colorado, a structural basin filled with alluvial fan deposits, is notable among these parks and valleys because of its size. It is about 100 miles long by 50 miles wide, and contained nearly 400,000 acres from which crops were harvested in 1929. Practically all the crops are irrigated; indeed, the irrigated acreage is two-thirds greater than the crop acreage, indicating extensive irrigated pastures. The valley has over 3,000 artesian wells, but most of the irrigation water comes from streams, principally the Rio Grande. Because of the altitude of the valley—7,500 feet in the center to 8,000 feet at the base of the mountains, only cool-climate and frost-resistant crops are grown—hay, principally timothy and clover, alfalfa and wild hay, potatoes, oats, wheat and barley, peas, and lettuce. The 3,000 acres of late lettuce is perhaps the most valuable crop in the valley.

The upper Arkansas Valley, which is much smaller and a little higher, lies just to the north of the San Luis Valley over a low divide. It had

FIGURE 295.—Walden, Colorado, in the center of North Park, 8,100 feet elevation. The hay meadows in the middle distance are irrigated by the flood method from the stream in the foreground; but as the land has not been leveled, the application of water is irregular. Note the school house at the edge of the village, a typical location. As usual in the West, the school is the largest building in the town. (Photo by E. O. Wooton, Courtesy of U. S. Bur. of Agric. Econ.)

25,000 acres of crops in 1929, mostly hay and the small grains, all irrigated, also 440 acres of lettuce. Other notable basins in Colorado are South Park, Middle Park, and North Park, in which there were 44,000 acres, 29,000, and 90,000 acres of crops, respectively, harvested in 1929, practically all irrigated wild hay, except that in Middle Park more than half the hay acreage was mixed timothy and clover. In North and Middle Park the acreage of irrigated pasture almost equalled that of the hay. The elevation of these parks ranges from 8,000 to 10,000 feet. The land, it will be noted, is used principally to supply winter feed (hay) for the cattle and sheep that graze in the national forests during the summer season (Figs. 295, 296, and 297).

In Wyoming, there are the Laramie and Carbon Basins, the Wind River and Bridger Basins, and the Big Horn Basin, all, except the Big Horn Basin, peripheral embayments of the vast Wyoming Basin, which is an arid plateau, 7,000 feet high and roughly 250 miles square. The Laramie Basin, about 100 miles long by 30 wide, with an elevation of 7,000 to 7,500 feet, had over 125,000 acres of irrigated land in 1929, nearly all hay and pasture, but including a few hundred acres each of potatoes, oats, barley, wheat, and nearly a hundred of lettuce. The Carbon Basin lying west of the Laramie contains about 100,000 acres of irrigated land, mostly hay and pasture. The Wind River Basin, 200 miles to the northwest and lying between the Wind River and Owl Creek ranges of the Middle Rocky Mountain system, has a lower altitude—5,000 to 7,000 feet—and contains about 80,000 acres of irrigated land, mostly along the flood plains of the Wind and Big Horn Rivers. Over half of the irrigated land is in hay, principally alfalfa; over one-fourth in pasture;

FIGURE 296.—A "park" in the mountains of Colorado (Montezuma National Forest). Note the Hereford cattle in the bunch grass and yuccas, with fir trees growing on moister soil on the other side of the dry river bottom. The Sheep Mountains may be seen in the distance, still carrying snow on their slopes. (Photo by W. J. Tubkin, Courtesy of U. S. Forest Service.)

and the remainder in grain, with a few hundred acres each of potatoes and sugar beets.

The Big Horn Basin has land level enough for crop production only in the central portion, an ellipse about 75 by 45 miles wide, and only north of the Graybull River in this ellipse is even half of the land topographically arable. The elevation, about 4,000 feet, and the rainfall, 5 to 10 inches, are low, and all crops are irrigated. Over half of the water comes from the Shoshone River, on which one of the highest dams in the world has been erected by the Reclamation Service (Fig. 290). About 250,000 acres were irrigated in the Basin in 1930, of which three-fourths were in crops and one-fourth used only for pasture. Hay, mostly alfalfa, occupied over half of the crop acreage. Grain and sugar beets shared most of the remaining acreage. Several thousand acres of corn, as well as the sugar beets, reveal the much warmer climate resulting from the lower altitude.

The Bridger Basin in southwestern Wyoming, 6,000 to 8,000 feet elevation, is drained by the Green River, a tributary of the Colorado, and may be considered a western-slope district despite the fact that it lies east of the mountains. It had 300,000 acres of irrigated land in 1929, three-fourths of which was in hay, principally wild hay and alfalfa, a fifth in pasture, and the remainder mostly in small grain.

Continuing southward along the west side of the Rocky Mountains, the first district of agricultural importance is the highland of northwestern Colorado, drained by the Yampa River. Here on high plains north of Craig and on the mountain slopes above Steamboat Springs is a considerable area of dry-farming land —about 60,000 acres in wheat, oats, and barley in 1929. But the dry-farming is of much less importance than the 80,000 acres of irrigated crops, mostly in timothy, clover, and alfalfa, along the Yampa and other river valleys (Fig. 298). South of the Yampa, over the Danforth Hills,

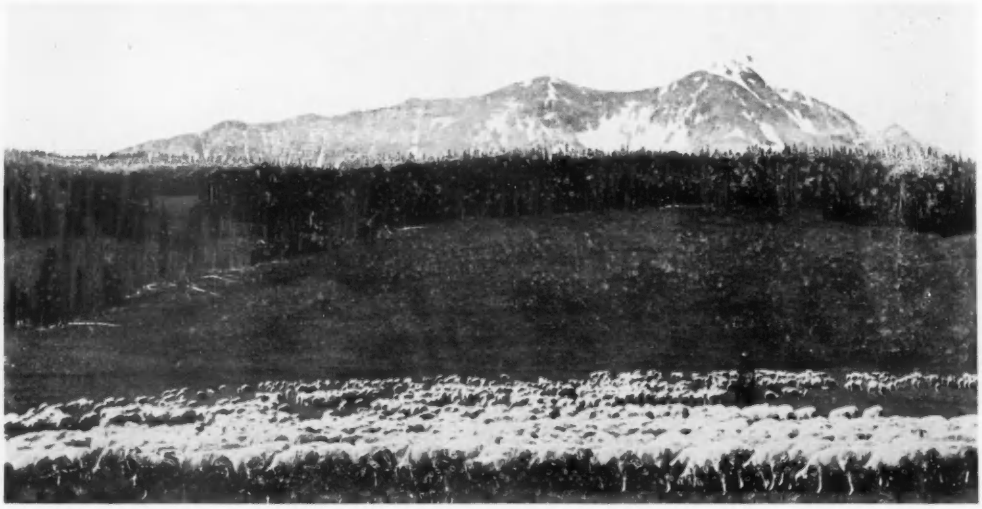


FIGURE 297.—Sheep near the foot of Mount Wilson in the Montezuma National Forest, Colorado. Note the shepherd on horseback (rather unusual), and the sheep grazing in dense formation, which is hard on the range vegetation. The mountain behind rises above timber line. (Photo by W. J. Tubken, Courtesy of U. S. Forest Service.)

lies the valley of the White River, which has 44,000 acres in crops, mostly irrigated, and principally hay (Fig. 299).

South of the White River Valley, over a high mesa or broad flat ridge, 100 miles long (which belongs to the Colorado Plateaus rather than the Rocky Mountain system) lie the valleys of the Grand River and of the Gunnison, a northwesterly flowing tributary of the Grand. These valleys, including the Uncompahgre, which is irrigated by a tunnel from

FIGURE 298.—The upper Yampa Valley just east of Steamboat Springs, northwestern Colorado, altitude, 6,700 feet. Sagebrush in the foreground, dry-land wheat in the left middle distance and on the benches beyond; irrigated hay and pasture with ditch in the right middle distance. The Yampa River, the Moffat Railroad, the highway (U. S. No. 40), a telephone line, and a homestead can be seen to the right of the center; and, above, alternating patches of forest and grassland on the mountain, which is a part of the Routt National Forest. (Photo by E. O. Wooton, Courtesy of U. S. Bur. of Agric. Econ.)

FIGURE 299.—An irrigated oat field on the bench just south of Meeker, Colorado, in the White River Valley, altitude 6,240 feet. Patches of dry-land wheat can be seen on the hill slope in the distance. Note the trees on the lane to the house and the four stacks of hay in the distance. (Photo by E. O. Wooton, Courtesy of U. S. Bur. of Agric. Econ.)

the Gunnison, and including the little valleys high in the Rocky Mountains which drain into them, had over 500,000 acres of irrigated land in 1929, three-fourths in crops and one-fourth in pasture. Half the crop land was in alfalfa hay, and most of the remainder in small grains and fruit; but there are also several thousand acres each of sugar beets and potatoes (Fig. 300). The Grand Valley near Grand Junction and the Uncompahgre Valley from Delta to Montrose, also a branch valley to Paonia and beyond, constitutes one of the famous fruit districts of the west (Fig. 301). In these valleys in 1929 there were over 600,000 apple

FIGURE 300.—The upper Uncompahgre Valley in western Colorado, with the San Juan mountains in the background. In the middle distance can be seen the level irrigated fields, with trees along the river, and the occasional roof of a house or barn. In the foreground is typical, sparse native vegetation, also a fill for a road in process of construction. (Courtesy of U. S. Bur. of Reclamation.)

trees and nearly as many peach trees, together with many thousand pear and prune trees and 75,000 grape vines. When the trees are in bloom in the spring time, the contrast with the green alfalfa fields and the snow-covered mountains on all sides is beautiful.

MIDDLE AND NORTHERN ROCKY MOUNTAIN VALLEYS

In northeastern Utah, south of the Uinta Mountains, and north of a long mesa-like ridge lies the Uinta Basin. It is one of the largest productive districts in the United States without a railroad.[1] Over 220,000 acres of land were irrigated in the Basin in 1929, but only 120,000 acres, according to the census, were in crops. Alfalfa is the dominant crop, because the climate permits and a crop must be grown which can be concentrated into cattle and sheep and driven over the mountains to market.

West of the Uinta Basin rise the Wasatch Mountains, a range of the Middle Rocky Mountains which extends from southern Idaho southward to Mt. Nebo, east of Nephi; but the name is used commonly to include also the plateaus and mountains which extend southward from the pass south of Mt. Nebo almost to the southern boundary of Utah. West of the Wasatch Mountains lies the Great Salt Lake, its eastern margin fringed by irrigated land practically its entire length, as is also the Bear Valley to the north and the Jordan Valley to the south. This is the area of first settlement by the Mormons and is truly the heart of Utah. More recently it has become the hub of the inland West.

FIGURE 301.—The Uncompahgre Valley near Montrose, Colorado. An orchard farm below the ditch, with alfalfa fields in the distance, and rabbit sage above the ditch in the foreground. (Courtesy of U. S. Bur. of Reclamation.)

Although little was known about the "Great American Desert" 83 years ago, when Joseph Smith led his followers on their courageous march over a thousand miles of barren plains and desert wastes, he could not have selected for settlement a more favored district in the entire West. The frost-free season is exceptionally long, in part owing to the low altitude and in part be-

[1] The Moffatt Railroad was to have placed the Basin on a short line from Salt Lake to Denver, but owing to the death of Mr. Moffatt and financial difficulties, the road was not completed west of Craig, Colorado.

cause of the influence of the Lake, the soils are fertile, and water for irrigation is readily available, while the location of Salt Lake on the direct route to California resulted, a few years later, in sales of farm products at fabulous prices to the flood of eastern adventurers en route to California in search of gold. But the Mormon pioneers deserve great praise for working out irrigation practices which later settlers in the West have followed, and for developing in a wilderness of deserts and mountains a civilization whose standards of education and social organization are not surpassed in any part of the United States, if, indeed, in the world.

This district, or rather chain of districts along the western front of the Wasatch Mountains, had over 400,000 acres of irrigated land in 1929, or about a third of all the irrigated land of Utah. In addition, there were over 50,000 acres of dry-land crops, mostly wheat. The irrigated crops are exceedingly varied, but, in general, hay, principally alfalfa, occupies about half the crop area. Wheat ranks next in acreage (135,000 acres in 1929), followed by sugar beets (25,000 acres), barley (15,000 acres), and potatoes (8,000 acres). Other vegetables grown for sale, of which tomatoes, peas, onions, and cantaloupes were the most important, totaled over 17,000 acres; while there were over a half million apple trees and as many more peach trees, 50,000 each of pear and prune trees, and 250,000 grape vines in the "oasis."

Utah is a charming state, especially to the geographer. Nowhere in the nation is there a closer adaptation of agriculture and its institutions to the natural conditions. This adaptation has been splendidly and accurately described by a native of the state, Mr. Murray E. King, of Salt Lake City:[2]

"Picture a wild tumble of forest-splashed mountain ranges flung in a great semicircle from the middle of the northern boundary of the State to the southwest corner. To the

FIGURE 302.—Ogden, Utah, showing its location on an alluvial fan at the mouth of a canyon. Such a location is typical of many cities in the Grazing and Irrigated Crops Region. The canyon not only affords access to or through the mountains, but also the stream in the canyon provides water for irrigation. (Courtesy of U. S. Bur. of Reclamation.)

[2] "These United States, A Symposium," Boni and Liveright, New York, 1923, pp. 74–76.

west and north of this a vast, gray desert—wide, flat valleys; far, lone hills; low sunburned ranges; salt-rimmed lakes; glistening alkaline flats; blinding-white salt deserts—all spreading with increasing desolation to Nevada and beyond. To the east and south an immense red sandstone desert beats in tumultuous rock waves from the edge of the State to the base of the mountains—a mesa land, abysmally gorged, savagely painted, weirdly weathered and sculptured, and touched with a thorny subtropical vegetation. This is Utah in outline. Its inhabitants cling tenaciously to the central crescent of mountains. They huddle along the edges of the red and the gray deserts. But only rarely and timidly do they follow the river valleys out into these wastes.

"If this is a forbidding picture, you have not learned the lure and deception of Utah. Through the heart of the mountains for three hundred miles north and south runs a single connected chain of watered valleys, green in the north among the jumbled, snow-capped peaks of the Wasatches, gray among the naked, forest-fringed mountains of the south, except where the little settlements have spread their rugs of green—Cache Valley, Ogden Valley, Salt Lake Valley, Provo Valley, Indianola Valley, San Pete Valley, Sevier Valley, Circle Valley, Panguitch Valley, Grass Valley. Here along torrents emerging from canyons, or on the banks of valley rivers, in cozy towns and villages girdled by green fields and smothered in orchards and shade trees, dwell more than half the rural folk of Utah (Fig. 302).

"Not less picturesquely placed are the towns on the edge of the gray desert at the mouths of the canyons

FIGURE 303.—The Palisades, from the Lodge, Bryce Canyon National Park, Utah. The picture fails to show the gorgeous coloring of the various strata of rock undergoing erosion. The scenic attractions of the mountains in the Grazing and Irrigated Crops Region constitute an increasing source of income to its inhabitants. Many cattle ranches have been metamorphosed into "Dude" ranches, others into schools for children needing outdoor life, and others into hotels or mere boarding houses. There is no more beautiful or interesting portion of the United States, and it is not unlikely that with the further building of good roads, the Rocky Mountains and Colorado Plateau sections particularly will become a great tourist and summer-home region for city people. (Courtesy of U. S. Bureau of Reclamation.)

of the Pavant and Tushar mountains. From each of these green deltas, which look down upon the wide desert fading to purple and azure in the distance, rises a green lane beside torrential waters through ragged gorges to a cool upland of lakes, woods, and meadows. But strangest of all are the settlements on the edge of the red desert in Utah's Dixie. The gorges of the painted desert head in little, funnel-shaped canyons at the base of the mountains. Canyon torrents drop sheer to these through zones of fir, white pine, long-leaf pine, cottonwood, squaw bush, chaparral, cactus and Joshua trees, and are diverted by the settlers to the hot, sandy soil. The canyon floors and the mesas above become bowers of subtropical foliage, flower, and fruit in the midst of gaunt desolation.

FIGURE 304.—Elk crossing Bear Creek, Lewis and Clark National Forest, Montana. The forests of the Region also are becoming great recreation grounds. (Photo by C. R. Townsend, Courtesy of U. S. Forest Service.)

"The farming communities in this setting embody what is basic in Utah. The location of more than three-fourths of them at the mouths of canyons is most propitious for delightful contrasts of climate and scenery and communal self-sufficiency. The canyon is a boulevard and a summer resort; the canyon stream an exclusive community possession for turning the industries and conquering the desert and transforming it into a fruitful Eden; the mountains a great, free timber reserve and summer pasture; the valley an empire of land in process of conquest; the desert a winter range. . . ."

The Bear River Range of mountains extends from Utah into Idaho, and there are many other short ranges of mountains in the southeastern corner of Idaho, while to the east, in Wyoming, lies the Wyoming range. The streams flowing in the valleys between these mountains (the Bear River emptying into the Great Salt Lake, the others into the Snake River) provide water for the irrigation of about 300,000 acres of land, excluding the land on the Snake River Plains which constitute a separate subregion. In addition, there were about 170,000 acres of dry-land crops in the mountain valleys and benches of southeastern Idaho in 1929 (see Fig. 305).

The principal crops are hay and wheat, both fall and spring sown (270,000 acres). Most of the wheat is unirrigated and most of the hay is irrigated, principally 120,000 acres of alfalfa. In the high mountain meadows about 30,000 acres of timothy were cut, and in these meadows and elsewhere about 40,000 acres of wild hay also. The only other crops of importance are barley (30,000 acres), oats (23,000 acres), potatoes and beets (each 10,000 acres), except that in Franklin and Teton counties there were over 600 acres of green peas (for canning) in 1929. The sugar beet crop in value is almost comparable with the wheat and the hay.

The hay and grain, other than wheat, also the pasturage from a much greater area (several million acres), is used to feed about 100,000 cattle and 500,000 sheep. A fourth

of the cattle are dairy cows. In addition there were, in 1930, about 35,000 horses, 30,000 swine, and 200,000 chickens in these southeastern Idaho counties.

In western Montana there is a similar series of valleys. Some of these valleys drain west into branches of the Columbia River, some east into the Missouri and its branches. In the Missouri valley from Dearborn nearly 1,000 farms and 120,000 acres of crops, practically all irrigated; and in the area drained by the Jefferson River, including its two main branches, the Beaverhead and the Bighole, there were about 1,200 farms, which contained nearly 300,000 acres of crops in 1929, of which over 250,000 acres were irrigated. Hay is the dominant crop in all these valleys, except the Gallatin, in which

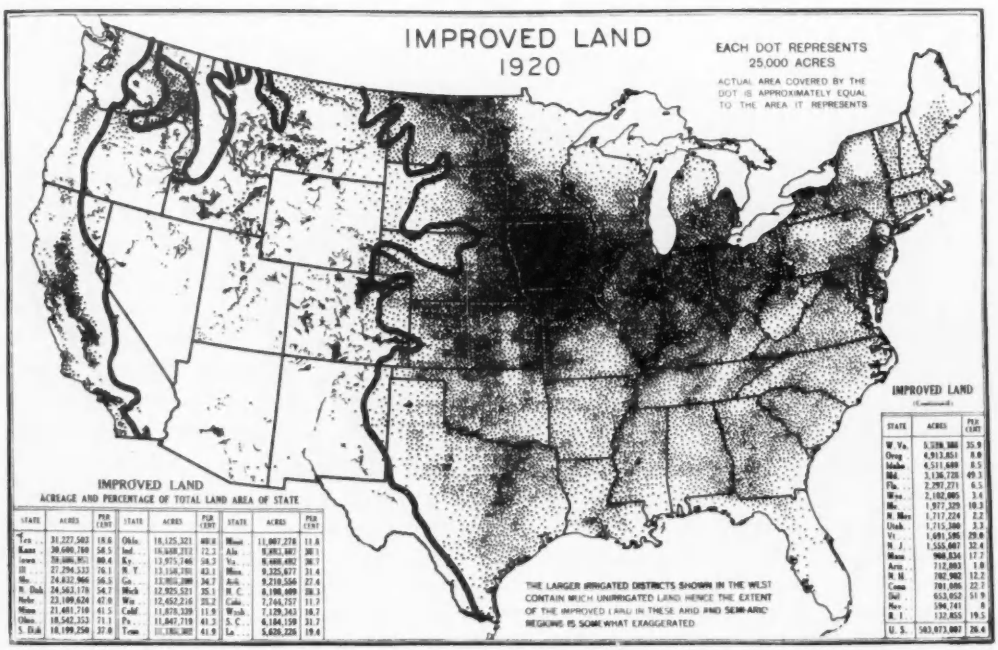

IMPROVED LAND
1920
EACH DOT REPRESENTS
25,000 ACRES
ACTUAL AREA COVERED BY THE DOT IS APPROXIMATELY EQUAL TO THE AREA IT REPRESENTS
IMPROVED LAND
ACREAGE AND PERCENTAGE OF TOTAL LAND AREA OF STATE
IMPROVED LAND
THE LARGER IRRIGATED DISTRICTS SHOWN IN THE WEST CONTAIN MUCH UNIRRIGATED LAND HENCE THE EXTENT OF THE IMPROVED LAND IN THESE ARID AND SEMI-ARID REGIONS IS SOMEWHAT EXAGGERATED

FIGURE 305.—The concentration of improved land in the irrigated districts of the Grazing and Irrigated Crops Region is clearly shown in the map. Only along the eastern semi-arid margin of the Region in the Great Plains, and similarly along the margin of the Columbia Plateau Wheat Region, is there much non-irrigated improved land. It will be noted also that most of the irrigated land is in the northeastern half of the Region. (Courtesy of U. S. Bureau of Agric. Economics.)

to Three Forks there were in 1929 about 1,000 farms, having, in all, 120,000 acres in crops, of which nearly 70,000 acres were irrigated. At Three Forks the Missouri River divides into the Gallatin, Madison, and Jefferson Rivers. In the Gallatin valley there were over 1,000 farms, having about 150,000 acres of crops, of which about 100,000 acres were irrigated. In the Madison Valley the acreage of wheat in 1929 was nearly a half greater than that of hay. Of the total crop acreage in all these valleys, one-fifth is in wheat and over two-thirds is in hay, of which alfalfa is the most important kind, except in the elevated Beaverhead and Bighole valleys, where nearly all the crop acreage consists of wild hay (see Fig. 320). The hay is used to feed about 50,000 horses,

200,000 cattle, 500,000 sheep, 36,000 swine, and 230,000 chickens. Most of the cattle are of the beef breeds, except in the Gallatin Valley where there are 6,000 dairy cows, also 13,000 swine.

Passing over the Divide into the Pacific drainage, most of the cropland is found in a long structural trough that extends from the southern end of the Bitterroot Valley for 150 miles northward to Kalispell (for 25 miles its valley is occupied by Flathead Lake), thence northwestward 70 miles to the Canadian boundary, where it continues for 500 miles nearly to Fort George, B. C. The United States portion of the valley is drained by the Clark Fork River and the Canadian portion by the Kootenay, Columbia, and Fraser Rivers. This is one of the longest well-defined valleys in the world. The width of the valley bottom between the steep mountain slopes seldom exceeds 20 miles, and will not average 10 miles. In parts of this valley, particularly in Flathead County, Montana, crops can be grown without irrigation, but irrigation has been found desirable, if not necessary, in most of the valley, particularly for the production of fruit. Agriculture is confined to the portion south of Beavermouth, B. C., and railroad transportation is available for the entire distance from Beavermouth to Hamilton, in the Bitterroot Valley of Montana, except

FIGURE 306.—View of Upper Naches Valley, Yakima Irrigation Project, Washington. The rows of fruit trees, varying in age, the fields of hay, of small grain and of corn, the roads, the houses and barns, and the cottonwood trees, along the river, offer a striking contrast to the barren hills in the distance above the irrigation ditch. (Courtesy of Bureau of Reclamation, U. S. Dept. of the Interior.)

FIGURE 307.—Typical orchard development on bench lands sloping to Okanogan Lake, near Penticton, B. C. This is the leading fruit district in British Columbia, producing normally 2,000,000 to 3,000,000 boxes of apples yearly, and smaller quantities of peaches, cherries, pears, plums, and small fruits. The house, small barn, and packing shed are typical. (Courtesy of British Columbia Dept. of Agriculture.)

for the portion occupied by Flathead Lake, where there is steamboat service. The Grand Trunk Pacific also follows this valley from Tete Jaune almost to Fort George, B. C., but owing to the cold climate in this northern portion of the valley, there has been very little agricultural settlement.

The Bitterroot Valley at the southern end of this trough is noted for its apples. Here nearly all the crop land and some of the pasture land was irrigated—87,000 acres in 1929. There is about as much more irrigated land in all the rest of the trough, including possibly 10,000 acres in the semi-arid British Columbia portion, from Gateway to Briscoe. In this central portion of the valley in British Columbia, the winter temperatures are too low for fruit except the hardier apples and the small fruits. North of Flathead Lake there is little irrigation, except in the 125-mile segment in British Columbia from Gateway to Briscoe. There are about 6,000 farms in the trough as a whole—5,000 in Montana and 1,000 in British Columbia. Over half the 300,000 acres of crops is irrigated and nearly half, more or less, is dry-farmed.

The principal crops are hay (150,000 acres) and wheat (85,000 acres), mostly in the United States portion. Nearly half the hay is alfalfa, and a third is timothy and clover grown alone or mixed. In addition, there are about 20,000 acres each of oats and barley, and a few thousand acres of potatoes and sugar beets, the latter crop south of Flathead Lake. The hay and grain, except the wheat, also the forage from 80,000 acres of plowable pasture, and from millions of acres of range, mostly in the national forests, are consumed by about 25,000 horses, and over 90,000 cattle, of which there are nearly twice as many dairy cows as beef cows, 30,000 swine, 1,500 sheep, and 250,000 chickens.

The Clark Fork of the Columbia River crosses this structural valley at Missoula, in a southeast-northwest direction. In this transverse valley along the Clark Fork there were 1,100 farms in 1929, having 140,000 acres of crops, mostly irrigated. Hay is the dominant crop, with the acreage of timothy and clover, also of wild hay, exceeding that of alfalfa. In this narrower valley, with less crop acreage and more mountain range, beef cows outnumber dairy cows nearly three to one. There are about 10,000 horses, 50,000 cattle, and 200,000 sheep in the five counties which include nearly all the land in this transverse valley.

To the west of this Columbia—

FIGURE 308.—Several thousand acres of truck crops are grown in the Okanogan Lake and adjoining districts. There were over 1,000 acres each of onions, tomatoes, and potatoes in 1926, and smaller acreages of celery, cucumbers, melons, cabbage, and other vegetables. This picture shows a melon patch, with a typical landscape beyond the ditch, grass cover over a moraine, and open stands of yellow pine on the hills. (Photo by L. Stock, Penticton, Courtesy of British Columbia Dept. of Agriculture.)

Kootenay—Flathead trough and the Clark Fork Valley lie the Bitterroot Mountains in the United States portion and the Selkirk Mountains in British Columbia. These are high and wide mountain masses which condense enough moisture from the westerly winds, forced to rise along their western slopes, to render irrigation unnecessary. For 100 miles west from the crest of the Selkirks, and 150 miles west from the crest of the Bitterroots, there is a region characterized by humid farming in the eastern portion merging into dry farming in the western portion; with wheat farming dominant in the grassland portion south of the Columbia and Spokane Rivers, and fruit farming and dairying dominant in the forested portion to the north.

The southern grassland section of this non-irrigated region is almost coincident with the Columbia Plateau, and has been named the Columbia Plateau Wheat Region; while the northern fruit and dairying section was assigned in the agricultural region map of North America, published in connection with the first article of this series, to the Forest and Hay Region of Canada.[3] Further study of the climate and agriculture, however, indicates that this region north of the Columbia and Spokane Rivers, and extending southward along the forested western slopes of the Bitterroot Mountains, resembles more closely the Hay and Dairying Region of the Northeastern

[3] Contained in ECONOMIC GEOGRAPHY for October, 1926.

States and Southern Canada. Since neither irrigated land nor grazing land characterizes either of these regions, their further treatment must be left to a later article.

THE WASHINGTON-BRITISH COLUMBIA DRY BELT

Farther west in the lower southwestern portion of the Columbia Plateau, and in the Yakima Valley to the west, thence northward along the Columbia River to the Okanogan, and along the Okanogan River to Okanogan Lake, likewise in the grassland areas in the Similkameen and

FIGURE 309.—An irrigation ditch with an alfalfa field beyond, in the Yakima Valley. Note the sage bush on the hill slope above the ditch. (Courtesy of U. S. Bureau of Agric. Economics.)

Kettle River valleys and those around Kamloops and Merritt, British Columbia, also along the Fraser River and the lower portions of its tributaries from Lytton northward to Soda Creek, there is a dry zone lying in the rain shadow of the Cascades of Washington and the Coast Mountains of British Columbia. This dry zone is characterized by both irrigated and grazing land. It is the northernmost extension of the Grazing and Irrigated Crops Region; or, rather, it is an outlying island cut off from the main portion of the region to the south by the westward extension of the Columbia Plateau Wheat Region, which covers the northern slopes of the Blue Mountains of Oregon until these merge into the foothills of the Cascades. In a previous paper (ECONOMIC GEOGRAPHY, October, 1931, page 339) this rain-shadow belt was, by inference, assigned to the Columbia Plateau subregion, although only a small part of it belongs to the plateau. It seems better to consider it a separate subregion, and it will be referred to hereafter as the Washington-British Columbia Dry Belt.

On the 21,000 farms in this Dry Belt, 90 per cent of the 725,000 acres of crop land is irrigated, and 90 per cent of the irrigated land is in fruit (about 150,000 acres), hay (300,000 acres), and wheat (150,000 acres). Nearly two-thirds of the acreage of each of these crops, as well as of the irrigated land and number of farms, is in the Washington portion of the belt, and nearly one-third in the British Columbia portion, while a twentieth of the farms and a twelfth of the irrigated land is in the Oregon portion (Umatilla District). Fruit constitutes 60 per cent ($50,000,000 in 1929) of the value of all crops. Apples are the principal fruits, the Yakima, Wenatchee, and Okanogan districts being, perhaps, the best known in the world (Figs. 306 and 307). But pears, peaches, plums, and cherries are important crops, production of these fruits in the aggregate being normally a fourth to a third that of apples, and a few melons are grown (Fig. 308). Alfalfa constitutes over half the acreage and probably three-fourths the value of all hay (Figs. 309–311). In the Yakima Valley potatoes are a very important crop—5,000,000 bushels in 1929.

The hay is fed mostly to cattle, sheep, and horses. Dairy cows are three times as numerous as beef cows, the more intensive dairying being developed mostly on the irrigated land, the less intensive beef production on the arid to semi-arid grazing land. There were over 600,000 sheep in the Belt on April 1, 1930, mostly in the Yakima Valley, where the sheep-feeding industry is highly developed. There were also 600,000 chickens in the United States portion of the region, largely in the Yakima Valley.

This series of discontinuous irrigated areas lying along the eastern foot of the Cascade Range constitutes a belt of highly developed and intensive agriculture, resembling, in many respects, particularly in the rolling character of much of the land and relative freedom from alkali, the series of irrigated areas along the Front Range in Colorado. However, owing, possibly, to much greater freedom from low winter temperatures, fruit replaces sugar beets as the dominant crop.

FIGURE 310.—Mowing alfalfa on the Minidoka Project, Snake River Plains. Note the large stacks of hay in the background and the derricks used in stacking the hay. (Courtesy of Bureau of Reclamation, Dept. of the Interior.)

THE BLUE MOUNTAIN AND CENTRAL IDAHO VALLEYS

The Blue Mountains of Oregon are classified by Fenneman[4] in the Columbia Plateau physiographic province, and the mountains of west-central Idaho with the Northern Rocky Mountains. Nevertheless, the valleys in both mountain areas are similar in climate and agriculture, and are, therefore, combined into one sub-region. Both irrigated and dry-land crops are found in nearly all the valleys, the proportion of the crop area that is irrigated varying from 25 to over 75 per cent. Hay constitutes half or more of the crop area in most valleys, and the acreage of alfalfa is generally greater than that of all the other hays. In the high valleys timothy and clover or wild hay tend to replace alfalfa, and in dry-farming districts it is often replaced by grain hay. Wheat usually ranks next to hay in importance, and in Union and Wallowa counties, Oregon, the acre-

[4] Fenneman, Nevin M. *Physiography of the Western United States*, New York, 1931.

FIGURE 311.—Raking alfalfa hay to the stack, Yakima Valley. (Courtesy of Bureau of Reclamation, U. S. Dept. of the Interior.)

age of wheat in 1929 exceeded that of all hay. Oats and barley are minor crops. The wheat is mostly of the white Pacific type, and is both exported to Europe (through Portland usually) and consumed locally. The hay and feed grains are fed principally to cattle, horses, and sheep.

There are over 200,000 cattle in the sub-region, and the cows are about equally divided into those kept for beef and those kept primarily for milk production. Over 50,000 horses were reported in 1930, while sheep numbered nearly a million. There were also over 250,000 chickens. The cattle and sheep, and the horses also to a lesser extent, are grazed in the late spring, summer, and autumn on the mountain slopes and meadows, mostly in the national forests, and in the winter are brought down into the valleys and fed on the alfalfa and other hays.

In all, about 6,600 farms have been developed in these mountain valleys. These farms average 50 acres of irrigated land and almost as much dry-land crops per farm. However, many farms have only irrigated crops, many only dry-land crops. In addition, there are about 2,000 acres of grazing land per farm available, much of it of low carrying capacity.

THE SNAKE RIVER PLAINS

The Snake River Plains are physiographically part of the Columbia Plateau Province, the ancient valleys having been mostly submerged beneath deep lava flows, on which there has accumulated a mantle of wind-blown soils of desert origin. Like the Great Basin areas to the south and west, the climate is too dry for dry-farming, except in a few localities, but unlike the Basin areas the drainage is exterior through the Snake River, and also unlike them there is a large quantity of water in this river and its tributaries available for irrigation. With the Plains have been included the valleys of Butte, Custer, and Lemhi counties, because in these valleys the lay of the land, the climate, the soil, and the agriculture are similar to those of the Plains.

FIGURE 312.—A barley field in the Minidoka district, Idaho. Barley is much less important than wheat in the Grazing and Irrigated Crops Region, but the picture is typical of the level land used for small grain production by irrigation. (Courtesy of Bureau of Reclamation, U. S. Dept. of the Interior.)

The irrigated land in the Snake River Plains totals 1,700,000 acres, almost one-tenth of all the irrigated land in the nation. There are three major irrigated districts: (1) the upper valley district (600,000 acres irrigated in 1929), extending from American Falls to beyond St. Anthony, in which alfalfa, potatoes, sugar beets, and wheat are the dominant crops; (2) the central valley district (600,000 acres irrigated), extending from Hammett through Twin Falls to near Minidoka, in which potatoes and sugar beets are still important crops, but with the acreage of wheat (Fig. 312) about as large as that of alfalfa, and with beans the dominant crop in much of the district (2,500,000 bushels in 1929, partly seed for string bean growers and partly navy beans, "Great Northern" variety, for baking); (3) the lower valley district (500,000 acres irrigated) extending from Boise west and north to Weiser, in which beans and sugar beets practically disappear, potatoes sink to a subordinate position, corn is a crop as important as oats, but 70 per cent of the crop land is in alfalfa and wheat. In this warmer lower valley there were also 19,000 acres in fruit in 1930, principally apples, prunes, peaches, grapes, and small fruits. The potatoes of the upper valley, the beans of the central valley, and the fresh prunes of the lower valley have a reputation for size combined with quality which is the envy of other sections of the United States.

The 24,000 farms in the Snake River Plains averaged about 5 horses per farm on April 1, 1930, 10 cattle, of which 4 were dairy cows and 2 beef cows (mostly on different farms), 6 swine, 100 sheep, and 50 chickens. In reality only 5,000 farms had sheep, an average of nearly 500 per farm. The typical sheep ranch has one to three or four bands, each band consisting of 1,000 to 2,000 sheep, which graze in the national forests in summer and on the plains in spring and fall. In winter some sheep are run in the desert, but most of them are fed on the irrigated land. There are also many specialized feeding outfits in the irrigated areas, fattening lambs for the Eastern market. Dairying and lamb feeding have become the

principal animal industries on the irrigated lands.

THE KLAMATH-LASSEN COUNTRY

Between the Warner Mountains and the Sierra in California, and extending northward in Oregon along the foot of the Cascade Mountains, there is a country nearly 300 miles long by 40 to 100 miles wide consisting largely of intermingled grassland and pine forest, or pinon-juniper, in which, despite the 15 to 20 inches of annual rainfall, there is almost no dry farming. This is probably owing to the very dry summers and short frost-free season (mostly fewer than 100 days). The irrigated land in this area exceeds the acreage of crops harvested, indicating much irrigated pasture. Hay is the dominant crop, constituting 80 per cent of the acreage of all crops, wheat contributes 10 per cent of the crop acreage, potatoes 5 per cent, barley 3 per cent, oats 2 per cent. Alfalfa is the principal hay crop, with grain hay and wild hay also very important. The hay and pasture provide feed for 30,000 horses, 160,000 cattle (two-thirds beef cattle), and 500,000 sheep. The cattle and sheep especially are grazed on the range, which covers 13,000,000 acres, more or less. Dividing the 3,600 farms into 350,000 acres of irrigated land gives an average of nearly 100 acres per farm. The range similarly divided gives 3,600 acres.

THE GREAT BASIN

The Great Basin, from the agricultural standpoint, may be considered to include the Harney country (Harney County, most of Lake and Malheur Counties, also part of Crook and Deschutes, Oregon), Owyhee County, Idaho, the western tier of counties in Utah, excluding Washington County in the southwestern corner and the eastern portion of Box Elder County, all of Nevada, except the southern tip, and Mono and Inyo Counties, California. It is practically all desert, mostly of the sagebrush type, but with some extensive salt flats, and pinon-juniper woodland on the higher mountains. In this vast area, comprising nearly one-twelfth of the land of the United States, there are only 10,000 farms. A third of these farms are in western Utah (principally Millard County) nearly a third in Nevada, a third in southeastern Oregon and Owyhee County, Idaho, and about 300 in Inyo and Mono Counties, California.

The area of irrigated land exceeds that of all crops, there being much irrigated pasture. On the other hand, there are several thousand acres of dry-land grains in western Utah, particularly in Juab and Tooele Counties, and a little dry-farming in southeastern Oregon. Of the over 1,060,000 acres in crops in 1929, merely 10 per cent failed to produce a harvest (probably dry-land grain mostly). Of the area of crops harvested (960,000 acres), 80 per cent consisted of hay, about equally divided between alfalfa, wild hay, and other varieties, principally grain hay, timothy, and clover. Half of the wild hay is in southeastern Oregon, where vast areas of almost level land are irrigated very cheaply by diverting mountain streams along the upper edge of the irrigated tract. The only other important crops were wheat (80,000 acres), barley (20,000 acres), oats (11,000 acres), and corn (7,000 acres). There is a little fruit in Malheur County, Idaho (this portion of the county belongs to the

Snake River Plains), but almost none elsewhere in the area.

The hay and grain, except the wheat, was fed to about 100,000 horses in 1929, nearly 600,000 cattle, mostly beef cattle, and nearly 3,000,000 sheep. There are also about 50,000 swine and 600,000 chickens in the area. This is an average of 10 horses, 60 cattle, and 300 sheep per farm. But since less than eight-tenths of the farms had horses, six-tenths had cattle, and three-tenths had sheep, the average number per farm reporting becomes 12 horses, 100 cattle, and 1,000 sheep. Dividing the 114,000,000 acres of land in the area by the 8,000 farms that have horses, most of which have cattle or sheep also, gives an average of 14,000 acres per farm, which may be considered a rough figure of the grazing land available. Most of this grazing land is open range in the public domain, uncontrolled except by ownership of a water hole or forceful persuasion of the possessor, or is regulated range in the few national forests, where overgrazing is prevented by the permit system and careful supervision. Owing to inadequate control of grazing on the public domain, the carrying capacity has been greatly depleted.

THE COLORADO PLATEAUS

Southeast of the Great Basin lie the Colorado Plateaus, arid and semi-arid tablelands, for the most part too high above the rivers to be irrigated, except where the plateaus adjoin still higher mountains. In southwestern Colorado the Rocky Mountains rise above the plateaus and the mountain streams provide water for 230,000 acres of irrigated land (excluding the Grand Junction-Montrose districts, which have been described in connection with the Rocky Mountain sub-region). In southern Utah, likewise, the Parowan, Sevier, Manti, and other mountains provide enough water to the valleys and alluvial fans beneath to irrigate over 300,000 acres of land. In Northwestern New Mexico and in Southeastern Utah along the San Juan River and its tributaries there are 70,000 acres irrigated, and in Arizona along the Little Colorado River and its tributaries there are 20,000 acres of irrigated land. But along the master stream, the Colorado, there is practically no irrigated land in the Plateau sub-region, because the river flows far below the level of the surrounding country. In all there were over 600,000 acres of irrigated land in the sub-region in 1929, as compared with probably 75,000,000 acres of grazing land of one kind or another. But the grazing land is mostly of such low carrying capacity that it is probable the products of the range do not exceed in value the products of the irrigated land.

Near Monticello in southeastern Utah and southeasterly on the benches beneath the San Juan Mountains as far as Durango, Colorado, there is a considerable acreage of potential dry-farming land, of which only a small portion is in grain at present owing not only to the low prices but also to the high cost of transportation to market. There is also a little dry-farming land in the Arizona and New Mexico portions of the sub-region on the Mogollon Mesa and in the valleys and benches of the San Francisco and Datil Mountains. In the Arizona section of the region, the acreage of dry-land crops in 1929 about equaled that of irrigated crops, 20,000 acres of each.

As in most parts of the Grazing and

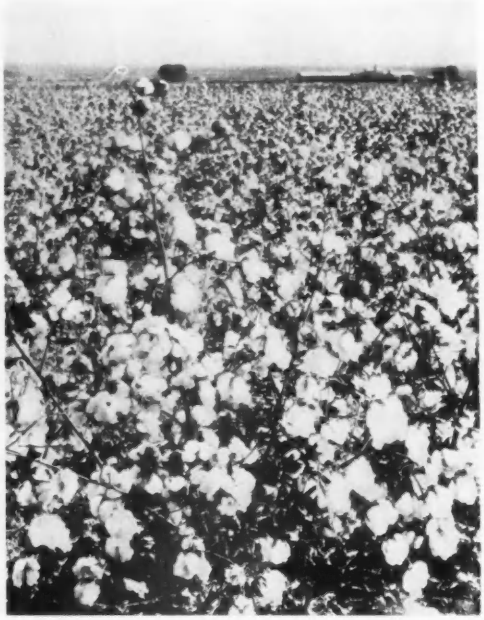


FIGURE 313.—A field of long-staple cotton in the Rio Grande irrigation project, southern New Mexico. Although the acre-yield of irrigated cotton averages nearly double that in the humid Cotton Belt, it is evident that the yield in this field is extraordinary even for irrigated cotton. (Courtesy of Bureau of Reclamation, U. S. Dept. of the Interior.)

Irrigated Crops Region, hay is the principal crop, occupying nearly half of the total crop acreage. Alfalfa constitutes 60 per cent of the acreage and probably 80 per cent of the value of all hay. There is a small acreage of grain hay, mostly dry-farmed, and a small acreage also of timothy and of wild hay in the high mountain valleys. The acreage in wheat is less than half that in hay, while the acreage of oats is half that of wheat, and of barley half that of oats. The acreage of potatoes is half that of barley, but the value of the crop is much greater. In the warmer portions of the sub-region corn is a very important crop, among the Pueblo Indians the principal foodstuff. The area in corn, 55,000 acres, was only a little smaller than that in wheat. In all there were about 500,000 acres in crops in the sub-region in 1929, an average of about 21 acres per farm. In addition, there were 125,000 acres of irrigated pasture, an average of 7 acres per farm. The 75,000,000 acres of range more or less, divided by the 18,000 farms, which includes many small irrigated farms, gives an average of over 4,000 acres. A typical cattle ranch, however, has much more land than this, sometimes 50,000 to 100,000 acres, and a flock of sheep during the course of the year is likely to range over tens of thousands of acres.

The Colorado Plateaus are primarily a cattle (for beef) and sheep country. There were nearly 700,000 cattle enumerated by the census on April 1, 1930, and over 2,600,000 sheep. In addition, there were over 100,000 horses, partly used for power on irrigated farms, partly to ride the range.

THE MEXICAN PLATEAU

South of the Colorado Plateaus the Mexican Plateau extends across southern New Mexico and Arizona and into Mexico for hundreds of miles. Statistical data are not yet available from the 1930 Mexican Census, and it is very doubtful if the small portion of the sub-region in the United States is a fair sample. Nevertheless, the United States Census may provide a very general idea of the agriculture of the sub-region. Nearly all the crops are irrigated (about 90 per cent). Although 10 per cent of the crop acreage is not irrigated, a crop can seldom be grown by natural rainfall. Commonly Mexicans or Indians plant corn in the mouth of a gulley or "arroya" where rainfall will be concentrated and sink into the soil, or sometimes a crop is planted in a sub-irrigated "wash."

FIGURE 314.—Soaking land for the first time, Imperial Valley, California. The irrigated land of this valley is on a delta built by the Colorado River across the former extension of the Gulf of California. The altitude is low, much of it below sea level, the climate is hot, the evaporation high, and large quantities of irrigation water are used. (Courtesy of Bureau of Reclamation, U. S. Dept. of the Interior.)

Crop production is practically confined to two districts, the Rio Grande Valley from Santa Fé, New Mexico, to Presidio, Texas, and the valleys in Arizona lying between the Colorado Plateau and the Sonoran Desert. In the Rio Grande Valley there are over 200,000 acres of irrigated land. In the northern portion (north of Rincon) the principal crops are corn, beans (pinto mostly), hay (alfalfa mostly), and wheat. The population of the valley is dominantly Mexican or Indian (Pueblo), and corn and beans, supplemented with wheat, constitute the staff of life. In the southern portion of the valley the principal crop in 1929 was cotton (100,000 acres), all irrigated (Fig. 313). Of much less importance was the hay (mostly alfalfa) and corn. Wheat and barley almost disappear, primarily because the sub-region cannot compete with the Great Plains, and not because these crops cannot be grown, for both crops can stand heat so long as the air is dry. In the Arizona Valleys beneath the Mogollon Mesa and in the southeastern portion of the State there are about 60,000 acres in crops, mostly hay (alfalfa and wild hay), corn, the sorghums, wheat, and beans.

Cattle are many times more important than sheep, despite the aridity of the region, possibly because of the summer heat. As the carrying capacity of the range is less than in the Colorado Plateaus sub-region, the cattle ranches tend to be larger in area.

THE SONORAN DESERT

South of the Great Basin and west of the Mexican Plateau lies the Sonoran Desert. It includes southwestern Arizona, a portion of Washington County, Utah ("Utah's Dixie"), the southern portion of Nevada (Clark County), southeastern California, and extends into Mexico for

150 or 200 miles, along each side of the Gulf of California (the southern limit being based not on a change in moisture conditions, but on freedom from frost). It is the hottest, driest portion of North America, with practically no crops grown except by irrigation. Moreover, the natural herbage is grazed but little, owing not only to its sparsity but also to lack of water holes and wells.

But where water is available this sub-region affords peculiar advantages for irrigation, because the growing season is year-long (5 to 7 crops of alfalfa are usually cut annually), the mild winter climate permits the growth of early vegetables and special varieties (like Iceberg lettuce) that command a good price in northern markets, also of long staple cotton, citrus fruits and dates, all of which crops yield products having normally a value per acre high enough to compensate for the heavy cost involved in providing and using the irrigating water (Fig. 314).

The land area of the United States portion of the Sonoran Desert is about 50,000,000 acres, but this means little for land without water has practically no value. There are 1,000,000 acres of irrigated land in the United States portion of the sub-region, most of which is in three districts: (1) the Salt River Valley, Arizona, including the Gila Valley adjacent, in which about 400,000 acres of land were irrigated in 1929; (2) the Imperial Valley, in California, including the Coachella, in which nearly 500,000 acres were irrigated in 1929 (with over 150,000 acres more in the Mexican portion); and (3) the Yuma, Arizona, project in which about 60,000 acres were irrigated. Much smaller irrigated areas are found in Washington County, Utah (around St. George—20,000 acres), in Clark County, Nevada (around

FIGURE 315.—Gathering "iceberg" lettuce in the Imperial Valley—the leading crop of the Valley. Much of the labor is Mexican. The lettuce starts moving to the markets in the eastern states in December, harvest is in full swing by February, and the rush season is over by March, but in other districts in California some lettuce is shipped every month of the year. (Courtesy of Bureau of Reclamation, U. S. Dept. of the Interior.)

Las Vegas—8,000 acres), and along the Colorado River in eastern Riverside County, California (22,000 acres). The highest agricultural development in the sub-region is in Maricopa County, Arizona, and Imperial County, California, and as these contain over 80 per cent of the irrigated land in the sub-region, a clearer and probably truer picture of its agriculture can be obtained from the statistics for these two counties only.

In the two counties the acreage irrigated exceeded the acreage in crops by 260,000 acres in 1929, indicating that nearly a third of the irrigated land was used only for pasture. In Imperial County in 1929 there were 676,000 acres in all crops, according to the local Chamber of Commerce, which, less 252,000 acres of double cropping (two or more crops on the land the same year), leaves 425,000 acres. The census gives 285,000 acres for land in harvested crops, and 432,000 acres irrigated. The census figure indicates that a large area of irrigated land was used only for pasture, and the local figure indicates a very small area. This discrepancy may be owing in part to the local statistics including alfalfa used only for pasture with crop land. Of the 555,000 acres in crops, 178,000 acres were in hay, practically all alfalfa, 158,000 acres were in cotton, 100,000 acres (or less because of double-cropping) were in vegetables harvested for sale,[5] and 26,000 acres were in fruit. There were also 48,000 acres in small grains, mostly barley in the Imperial Valley and wheat in the Salt River Valley, 28,000 acres of sorghum mostly for grain, 3,000 acres of corn, and less

FIGURE 316.—Picking cantaloupes in the Imperial Valley. This crop ranks next in importance to lettuce in the Valley. The cantaloupes start moving in May, shipment is at a peak in June, and the season is over by late July. (Courtesy of Bureau of Reclamation, U. S. Dept. of the Interior.)

[5] The aggregate area of the vegetables harvested for sale was nearly 103,000 acres, but sometimes two or more vegetable crops are raised during the year on the same land. Principally lettuce and cantaloupes. However, this is small. The area of vegetable crops harvested for sale in Imperial County in 1929 according to the census was 71,960 acres, but according to the California Department of Agriculture, 93,646 acres. In 1930 the Department of Agriculture estimate was 119,860 acres, and in 1931 the Los Angeles Chamber of Commerce figure was 130,427 acres.

FIGURE 317.—A grove of date palms, Yuma district, Arizona. Date culture in the Southwest began with the introduction of standard varieties by the U. S. Department of Agriculture in the year 1900. These palms are still growing at Tempe, Arizona, and are 25 to 30 feet high. In 1930 the census reported over 100,000 date palms, more than half of which, however, were not yet of bearing age. (Courtesy of Bureau of Reclamation, U. S. Dept. of the Interior.)

than 1,000 acres of potatoes and sweet potatoes.

The vegetables harvested for sale had a farm value of nearly $17,000,000 in 1929, most of which was contributed by lettuce and cantaloupes (Figs. 315 and 316). These two counties ship 90 per cent of the winter and early spring lettuce consumed in the United States and 70 to 90 per cent of the early cantaloupes. Early green peas are a less important crop in the Imperial Valley, and there are a few thousand acres each of watermelons, carrots, Bermuda onions (Coachella Valley) and asparagus. A dozen other vegetables are grown in commercial quantities in each valley. The industry is more fully mechanized than elsewhere in the United States or the world, several thousand acres of lettuce, for example, being handled by one operator and several score of hired men operating tractors equipped with especially devised cultivating implements. The average acreage, however, is much smaller, 303 farms growing 25,200 acres of lettuce in the Imperial Valley in 1929, an average of about 80 acres per farm. One man can handle this acreage except during cultivation and harvesting when four men will be needed. Likewise 308 farms grew 31,000 acres of cantaloupes, an average of about 100 acres per farm. Many of these farms grew both crops and sometimes other vegetable crops also. By 1931 the lettuce area had increased to 42,000 acres and the cantaloupe and melon area to 52,000 acres.

With reference to alfalfa, the 170,000 acres yielded 482,000 tons in

FIGURE 318.—A date palm, with fruit, in the Salt River Valley, Arizona. This is a heavy yield, but 200 pounds per tree is common, and 140 pounds is probably a fair average yield under favorable conditions. About 50 trees are planted per acre. A full bearing grove (10 years old and older) may, therefore, be expected to yield 7,000 pounds when the palms are in full bearing, and provided injury by insects and diseases is not severe. (Courtesy of Bureau of Reclamation, U. S. Dept. of the Interior.)

1929, an average of nearly 3 tons per acre. At $12 per ton this crop would be worth nearly $6,000,000. The 112,000 acres in the Imperial Valley were grown on 1,542 farms, which gives an average of 73 acres per farm. In addition, there were, possibly, 80,000 acres used only for pasture, an average of about 60 acres per farm. Several farmers, however, grew several hundred acres. Some of the alfalfa is shipped out, but it is mostly fed to dairy cows and sheep in these valleys. There were over 40,000 dairy cows in the two counties, April 1, 1930, and 164,000 sheep. Some of the sheep had gone to market, however, by this date. The sheep come mostly from the range and are fed in the valleys on the hay and pasturage, supplemented generally by grain during the winter. Old ewes are bought, and after lambing, are fattened for market. The lambs are largely marketed as milk fed lambs. Some of the alfalfa is used also to feed over 400,000 chickens and 24,000 horses. There are also a few swine (32,000 in the two counties). When the 183,000 acres of hay and 34,000 acres of barley are added to the 260,000 acres of pasture it appears that nearly half the irrigated land in these counties is used to feed live-stock.

The production of cotton in the Southwest is a development of the last 20 years. Formerly the cotton was nearly all long staple of the Egyptian type, but now a medium length staple is grown, mostly Acola, a variety developed by the U. S. Bureau of Plant Industry. The 158,000 acres in the two counties in 1929, mostly in Maricopa County, yielded 100,000 bales, an average of nearly two-thirds of a bale per acre. The farm value of the cotton crop in the two counties was nearly $13,000,000 in 1929.

Fruit also is important. Almost every fruit of the temperate and subtropical zones is grown, but the principal commercial production is of grapefruit, oranges, and dates (Figs. 317, 318, and 331). About 650,000 boxes of grapefruit were harvested in 1929 from 370,000 trees of bearing age, and in addition there were over 140,000 boxes of oranges. Most of the dates are grown in the Coachilla Valley, which adjoins the Imperial Valley on the northwest. In this valley and in Imperial and Maricopa Counties nearly 2,000,000 pounds were produced in 1929. The value of fruit and nuts in Imperial and Maricopa Counties amounted to $2,500,000 in 1929. By 1931 only 300 acres of cotton were grown on the United States portion of the Imperial Valley. The acreage in the Mexican portion was 70,000, which is half that in 1929.

Totalling all the crops, it appears that the 6,773 farms in the two counties produced $45,000,000 worth in 1929. The average in Imperial County was nearly $8,000 per farm, but in Maricopa County, $4,400. There were produced also dairy products to the value of over $6,500,000 and poultry and eggs to the value of $2,500,000, but these values duplicate in large measure the hay and grain produced.

These values have been developed out of the desert within a few decades, and show what can be done where the climate, the soil, and the crops grown are all favorable to irrigation. The Imperial and Salt River Valley areas are among the most successful irrigation districts in the United States. Unfortunately, not all irrigation projects have such a record of achievement.

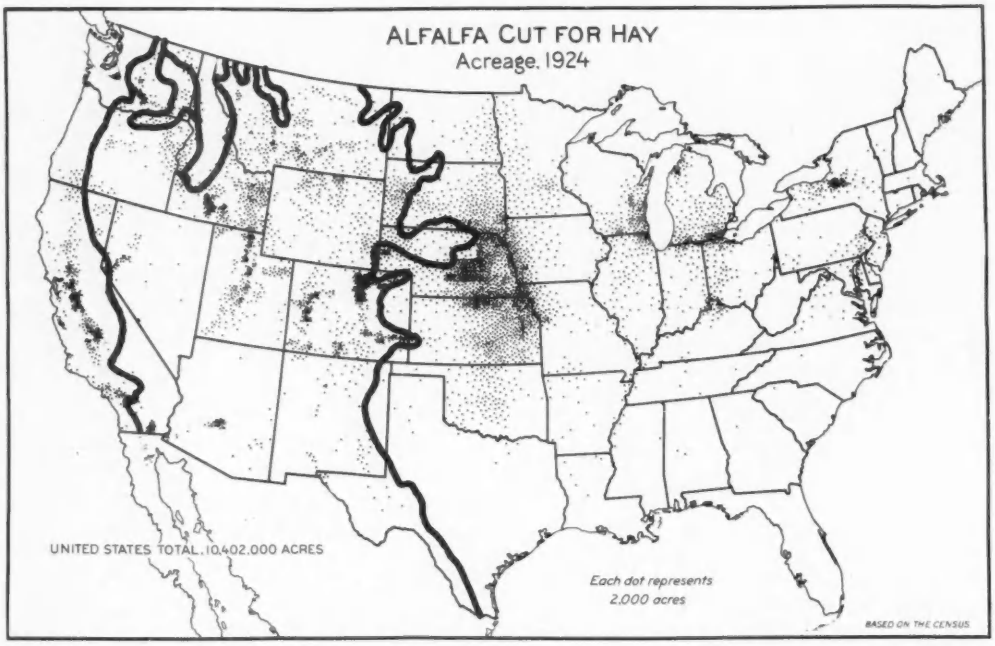


FIGURE 319.—Alfalfa is the leading crop in the Grazing and Irrigated Crops Region, both in acreage and in value. It is practically all grown under irrigation, consequently this map of alfalfa acreage resembles that of irrigated land (Fig. 305). The major areas of production are the South and North Platte Valleys in Colorado, Wyoming, and Nebraska. The Grand and Uncompaghre valleys in western Colorado, the Utah oases, the Upper, Middle and Lower areas in the Snake River Plains, the Yakima Valley in Washington, the Salt River Valley in Arizona and the Imperial Valley in southeastern California. (Courtesy of U. S. Bureau of Agric. Economics.)

THE CROPS IN GENERAL

Over half of the crop acreage in the United States portion of the Grazing and Irrigated Crops Region was in hay in 1924, and over a third was in grain. The remaining 14 per cent was devoted to minor crops from the standpoint of the region as a whole, but crops of great importance locally. Seventy per cent of the crop acreage was devoted to producing feed for livestock. Compared on the basis of value, hay constituted about 42 per cent of the total, the grain crops 25 per cent, fruits and vegetables 10 per cent, and other crops, principally cotton, sugar beets, and beans, 23 per cent. It will be noted that although fruits and vegetables and these minor crops include only 14 per cent of the acreage of all crops, they constitute 33 per cent of the total value.[6]

Alfalfa contributed about 43 per cent to the hay acreage and nearly 70 per cent to the value of all hay crops. The alfalfa crop is more than twice as valuable as any other crop in the part of the Region in the United States and probably in the Region as a whole. It is practically all irrigated. The major centers of production are the irrigated areas of Colorado, Utah, and southern Idaho, with smaller quantities grown in the irrigated valleys of Wyoming and Montana, eastern Washington and Oregon, in the Imperial and other

[6] Owing to the great increase in vegetable production in the Imperial and Salt River Valleys since 1924 and to the decline in price of hay and grain, it is probable that fruit and vegetables, cotton, beets, beans, and other locally important crops, now constitute fully 40 per cent of the value of all crops in the region.

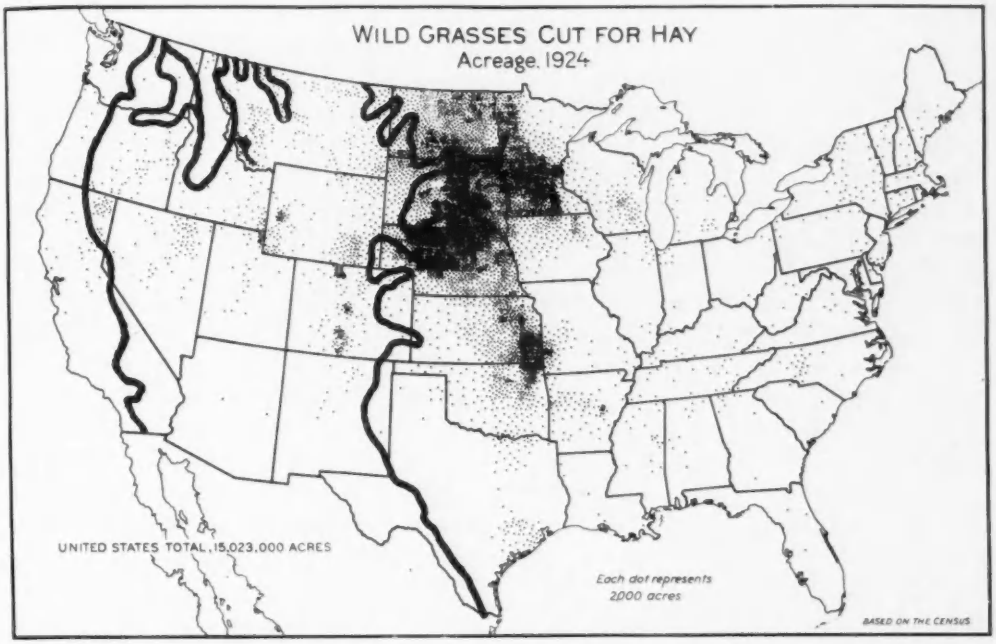


FIGURE 320.—Wild grasses are cut for hay on land too wet, too dry, or in a climate too cold for alfalfa. The five dense acres shown on the map—the San Luis Valley, South Park and North Park in Colorado, the Bridger Basin in Wyoming and the Beaverhead and Bighole Valleys in Montana, are all high, cool areas—too cool for successful alfalfa production. The scattered dots represent wild hay on land mostly too wet or too dry for alfalfa. (Courtesy of U. S. Bureau of Agric. Economics.)

valleys of eastern California, and in the irrigated districts of Nevada, Arizona, New Mexico, and western Texas (Fig. 319). The area in alfalfa in the United States portion of the region in recent years averages nearly 4,000,000 acres (excluding acreage used only for pasture), with a production of 10,500,000 tons. The crop is important likewise in Mexico, and extends northward into the Canadian portion of the Region also. However, the acreage in Canada is very small, and is confined to the warmer valleys.

The area in wild hay is three-fourths as great as that in alfalfa, but the value of the crops is only about one-fifth as great, owing both to a much smaller tonnage per acre and a much lower value per ton. The wild hay acreage is both concentrated and dispersed. It is concentrated in the San Luis Valley, South Park, and North Park in Colorado—high and cool mountain basins, and in southwestern Montana (Beaver-head County mostly) (Fig. 320). It is dispersed throughout much of the high plateau of southeastern Oregon, northeastern California and northern Nevada, in the high valleys of Utah, southern Idaho and western Wyoming, also in most of Montana, eastern Wyoming, and northeastern Colorado. Since wild hay may include many grasses and legumes with varying climatic and soil requirements, but characterized generally by low acre-yields, the crop is grown mostly where climate or soil conditions are too cold or too wet or too dry for alfalfa. It is found, therefore, principally at high elevations or in the northern portion of the Grazing and

Irrigated Crops Region—very little is grown in New Mexico, Arizona, southern Utah, and southern Nevada. Most of the wild hay is irrigated, commonly in the cheapest manner by a flood type of irrigation. On wet lands, particularly those receiving seepage from irrigation of higher land, and therefore, likely to have more or less alkali, it is generally the only crop that can be grown. Likewise, where the land is too dry to grow grain it may produce a good crop of hay in wet seasons. Along the arid margin of crop production, for example, particularly in eastern Montana and Wyoming, much of the wild hay is merely the natural vegetation of the range cut in a wet season; or from a moister spot in a normal season.

Alfalfa and wild hay constitute 90 per cent of the total hay acreage. In the cool mountain valleys of Colorado, northern Utah and northward, timothy is grown alone or mixed with clover, and, less commonly, orchard grass and red top become important hay crops; while in eastern Oregon, much of Montana, and parts of Wyoming and Colorado, principally along the arid margin of the dry-farming belt, wheat and oats, sometimes barley and rye, are cut for hay, particularly in dry years when the crop is not worth the cost of harvesting for grain.

Hay is the backbone of the stock ranching industry in the region, providing feed in winter and at other seasons when the range is short or cannot be grazed. Frequently, the amount of hay available sets the limit to the cattle industry. Owing to its low value per unit of weight or bulk, hay cannot be shipped far, except in drought years when the price is high and it must be purchased to save the stock from starvation. There is, therefore, often wide local variations in the price of the same kind and grade of hay.

Wheat is the principal grain crop in most of the United States and Canadian portions of the Region, but not in the Mexican portion. The area of wheat considerably exceeds that of all other small grains north of Mexico and is, likewise, much greater than that of corn and the sorghums combined. The wheat is of both winter and spring varieties, depending upon climatic conditions, and is irrigated only in part. The irrigated wheat is grown mostly in Colorado and Montana, Utah, and southern Idaho; while the dry land wheat is found along the margin of the dry farming areas on the Great Plains and of the Columbia Plateau in eastern Washington and Oregon. There is also a little dry-land wheat in the Snake River plains of southern Idaho, on some of the higher bench lands along the valleys in Utah, and doubtless a few acres in other localities in the Region. The wheat is mostly ground at local mills and consumed within the Region. The area in wheat in the United States portion of the Region averages nearly 3,000,000 acres in recent years, with an average acre yield of 20 bushels. In general, irrigated wheat has a much higher acre-yield than dry-land wheat, but the quality is much poorer. In Mexico, wheat production, on some 2,000,000 acres, is almost confined to the southern (higher) portion of the plateau.

Oats is the other important small grain. The acreage in the United States portion of the Region is about one-third that of wheat, and the crop is grown, in general, at somewhat higher elevations. There are almost

no oats grown in New Mexico, Arizona, Nevada, and the lower elevations in Utah, nor in the Washington portions of the Region (warm, irrigated river valleys). About one-seventh of the oats acreage was cut and fed unthreshed in 1924. The acreage of barley was about one-third that of oats in 1924. The crop is grown mostly in southern Idaho, Montana, and Colorado, and is now used almost wholly for stock feed. It is interesting to note both barley and wheat in the Salt River Valley of Arizona, one of the hottest districts in the United States. But these grains are grown here in the winter months. The acreage in rye is about half that in barley, and the crop is almost confined to the Great Plains portion of the Region. In 1909, however, a considerable acreage was reported in eastern Oregon and Washington. There were also 113,000 acres of flax included in the tabulation of the 1924 census figures, which had to be made by counties. This flax acreage was confined to Montana, and the flax is practically all produced on dry land.

Corn acreage, likewise, is almost confined to the Great Plains in the United States portion of the Region, except that in New Mexico and Arizona there are a few thousand acres grown in the higher valleys and plateaus by the Hopi and other Indians, also in the warmer portion of the Snake River Plains. There were about 1,750,000 acres in the United States portion of the Region in 1924. In Mexico the acreage, like that of wheat, is small in the hot and dry northern plateau section. But in the higher, cooler, and moister lands of the southern plateau there are about 5 million acres in corn. Corn and beans constitute the staple foods of the Mexican people. It is interesting to note that the hot belt extending up the Rio Grande from the east and up the lower Colorado and Gila Rivers from the west is almost devoid of corn. Under conditions of great heat and dryness, the corn ears do not fill well—apparently the dryness of the air depletes the vitality of the pollen.

In many of the hot, dry areas the grain sorghums (kafir, milo, feterita, etc.) constitute the principal summer grain crop. Not only are they more drought enduring than corn, but also they recover better after rain comes. From southwestern Kansas to the Rio Grande the sorghums are much more important than corn as dry-land crops, in fact, in western Texas and the Panhandle they almost wholly replace corn. The sorghums are also more important than corn in the hot but irrigated Salt River and Yuma districts in Arizona. On the cooler, irrigated lands in New Mexico, however, corn is generally more important. Three-fourths of the sorghum acreage is cut for hay or fodder (except in the Sonoran desert district), but only one-third of the corn acreage is grown primarily for fodder. Most of the corn for grain, except among the Indians and Mexicans, is used to feed stock.

Cotton ranks next to corn in value in the Region, even though production is confined practically to eight small districts—the Pecos and middle Rio Grande Valleys in New Mexico and Texas, lower Rio Grande Valley in Texas, the Salt River and Yuma districts in Arizona, the Imperial Valley and Palo Verde districts in California, the former extending into

Lower California, and the Laguna district in north central Mexico. In all these districts there were nearly a million acres of cotton in 1929, from which over 600,000 bales were produced—two-thirds in the American districts and one-third in the Mexican districts. The average yield per acre is twice that in the humid American Cotton Belt to the east. Moreover, some of the cotton is long-staple and the price per pound of this long-staple cotton is usually

tian and Mexican varieties of cotton by the United States Department of Agriculture and the state experiment stations.

Sugar beets in the northern portion of the Region, like cotton in the southern portion, provide a high value crop per acre, so essential, normally to the repayment of the costs of irrigation. There is no over-lap in the areas of production of these two crops.[7] Like cotton, the sugar-beet crop is confined to a few valleys,

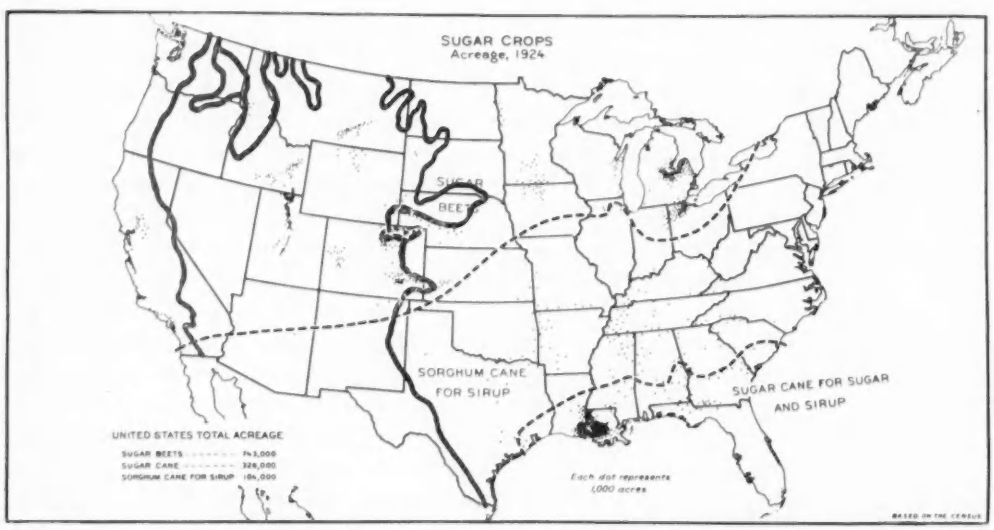


FIGURE 321.—Sugar beets are a very important crop in several irrigated valleys of the Grazing and Irrigated Crops Region,—in the South Platte and Arkansas Valleys of Colorado, in the North Platte Valley of Nebraska and Wyoming, in the series of irrigated areas along the western front of the Wasatch mountains in Utah, in the Upper Snake River Plains of Idaho, and in the Yellowstone Valley of Montana. In these six states 70 per cent of the sugar beet crop of the nation is grown. (Courtesy of U. S. Bureau of Agric. Economics.)

about a third greater than for middling cotton in the Cotton Belt. The average value of the crop per acre is, therefore, two to three times as great as in the Cotton Belt. Cotton has been produced in the Mexican portion of the Region for many years, but in the United States portion practically all the development has taken place during the last twenty years, partly as a result of the introduction and improvement of Egyp-

notably the South and North Platte valleys in Colorado, Nebraska, and Wyoming, the Arkansas Valley in Colorado and Kansas, the Jordan Valley and its continuation north along the western front of the Wasatch Mountains in Utah, the Cache Valley in Utah and Idaho, the Snake

[7] A sugar beet factory was built near Phoenix, Arizona, but the climate proved too warm, even in the winter season, for the production of high quality beets, so the production of sugar cane was attempted. This also proved a failure.

River plains of southeastern Idaho, and the Yellowstone Valley in Montana, with a small production in the valleys near Sheridan, Wyoming, in the Grand Junction-Montrose area of western Colorado, and in the valleys of central Utah (Fig. 321). All the beets are irrigated, and practically all are grown where the July temperature averages between 67 and 72 degrees. The area in beets ranged from 500,000 to 600,000 acres in recent years, production from five to seven million tons, and the value of the crop from 40 to 50 million dollars. About 40 per cent of the crop is produced in Colorado.

Potatoes are grown generally throughout the Region for home use, but commercial production is restricted to a few districts. In the past the Greeley district, in the South Platte Valley of Colorado, was famous for its potatoes, but now much larger quantities are grown in the San Luis Valley and on the Snake River Plains of southern Idaho; while there is a large production in the Yakima Valley of Washington; the Uncompagre Valley and other valleys of western Colorado, and in the valleys of northern Utah, with a scattered acreage in the many valleys of Montana. Recently the production of early potatoes (grown in winter) has developed rapidly in the lower Rio Grande Valley. Most of this crop is irrigated, but in many high mountain valleys there is enough moisture in the soil in summer to give large yields of potatoes without irrigation. Potatoes and barley are grown at higher altitudes than any other crop in the region except hay—above 10,000 feet in some of the valleys and on the plateaus of Colorado. At such elevation the growing season is short and frosts may occur in midsummer, but are not sufficiently severe, usually, to injure these crops seriously. As with most crops grown near the cold limit, the quality is excellent.

Beans are another important crop in the region, particularly in the Mexican portion, in New Mexico and in eastern Colorado, with a much smaller acreage in Wyoming and Montana. There is also a small but highly developed bean district in the Twin Falls area of southern Idaho. Here the beans are irrigated, but elsewhere in the United States portion of the Region they are grown mostly on dry land. In Mexico probably more than half the acreage is irrigated. Beans are the principal source of protein for the people of Mexico, and probably of New Mexico also. Production in the United States portion has ranged from 5 to 10 million bushels in recent years. Yield per acre is normally 4 to 8 bushels on dry land and 15 to 30 bushels when irrigated. Peas are an important crop in the San Luis Valley of Colorado, and in similar cool valleys in northeastern Idaho and southwestern Montana.

The Grazing and Irrigated Crops Region contains several famous fruit districts. Apples are vastly more important than all other fruits combined. The principal producing districts are the Yakima and Wenatchee Valleys in Washington, the Okanagan Valley of Washington and British Columbia, the Boise-Payette district in south Idaho, the Bitterroot Valley in western Montana, and the Grand Junction-Montrose districts in Colorado (Fig. 322). The Yakima and Wenatchee Valleys are the largest apple-producing districts in the United States, if not in the world, each producing 10,000,000 to

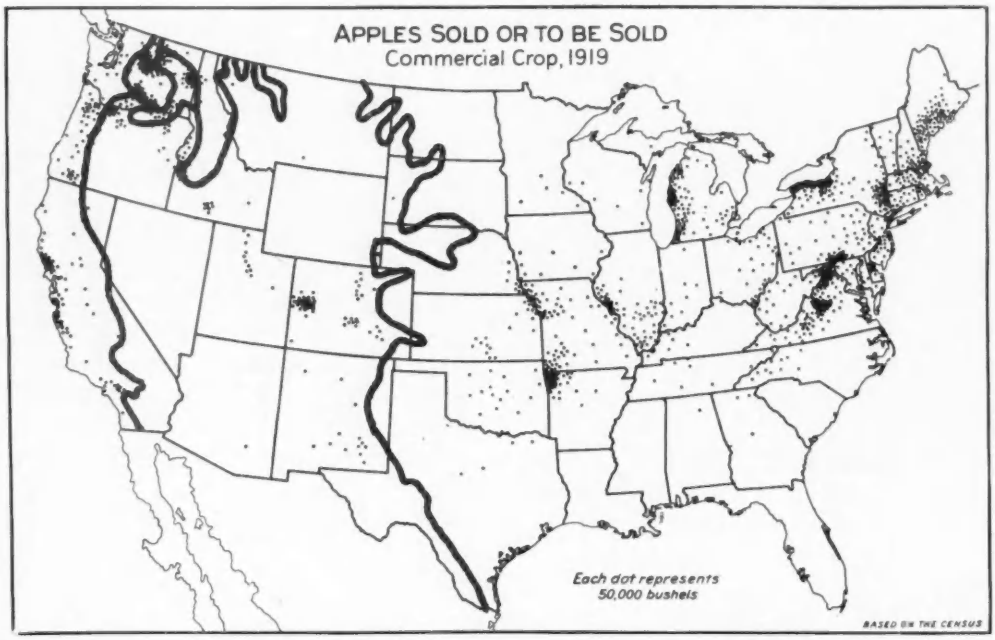


FIGURE 322.—The principal apple-producing districts in the Grazing and Irrigated Crops Region are the Yakima, Wenatchee, and Okanogan Valleys in Washington, the Boise-Weiser district in Idaho, and the Grand Junction-Montrose-Paonia district in Colorado. In these five districts about a third of the nation's commercial crop is produced. One-quarter of the nation's crop is produced in the Yakima and Wenatchee Valleys. (Courtesy of U. S. Bureau of Agric. Economics.)

15,000,000 bushels of high-grade apples in a normal year. The total production in the Grazing and Irrigated Crops Region ranges normally from 35 to 50 million bushels, of which three-fourths is commercial, that is, sold for consumption as fresh fruit. The production in the British Columbia Portion of the Region is now about 3,000,000 bushels, but in the Mexican portion is insignificant.

Peaches also are grown commercially in the region, in fact, are or have been an important crop in all the apple districts noted above, except the Bitterroot Valley. Peach trees are frequently used as fillers in young apple orchards. The principal districts in the Region at present are the Grand Junction-Montrose areas in western Colorado, the valley and piedmont slopes that stretch from Provo to Brigham, Utah, the Yakima Valley in Washington, and the Okanagan Valley in British Columbia. The peach crop of the region has a value only one-tenth to one-twentieth that of the apple crop. There is a large acreage of pears in the Yakima Valley, and a much smaller acreage in the Wenatchee Valley and in western Colorado and northern Utah. Prunes are grown extensively in the Boise-Payette district of southern Idaho, but wholly for consumption in fresh condition. There are several thousand acres of prunes also in the Yakima Valley, and a few hundred acres elsewhere in central Washington, in Utah, and in Colorado. The Yakima Valley also had about 450,000 grape vines in 1930, mostly native varieties, and the Salt River and Gila Valleys in Arizona, 300,000, practically all vinifera varieties. In

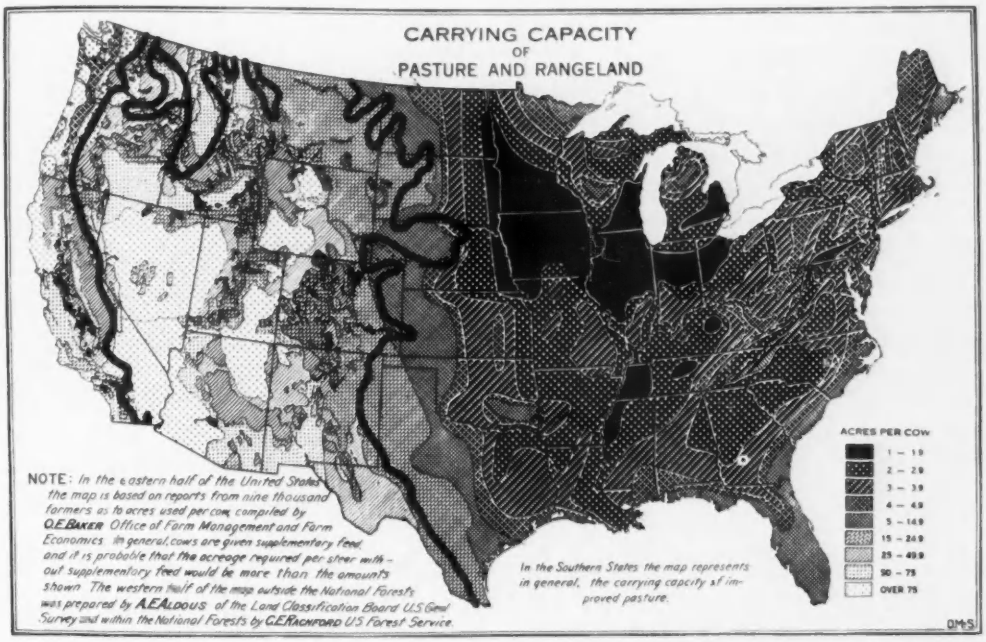

CARRYING CAPACITY
OF
PASTURE AND RANGELAND
ACRES PER COW
1 – 1.9
2 – 2.9
3 – 3.9
4 – 4.9
5 – 14.9
15 – 24.9
25 – 49.9
50 – 75
OVER 75
NOTE: In the eastern half of the United States the map is based on reports from nine thousand farmers as to acres used per cow, compiled by O.E.BAKER Office of Farm Management and Farm Economics. In general, cows are given supplementary feed and it is probable that the acreage required per steer without supplementary feed would be more than the amounts shown. The western half of the map outside the National Forests was prepared by A.E.ALDOUS of the Land Classification Board U.S.Geol. Survey and within the National Forests by C.E.RACHFORD U.S. Forest Service.
In the Southern States the map represents in general, the carrying capacity of improved pasture.
6
OM-S

FIGURE 323.—More than half the grazing land of the Grazing and Irrigated Crops Region is so dry that 50 acres or more are required to carry a cow during the season, and most of the remaining grazing area requires 15 to 50 acres. Good irrigated pasture, on the other hand, will carry a cow to 1 to 2 acres, and the best pastures more than a cow to the acre. The higher carrying capacity of the grazing land in the mountains of Colorado, Utah, Idaho, and southwestern Montana are shown on the map, and the low carrying capacity of the deserts of Nevada and eastern California, western and northeastern Arizona, and the Wyoming and Bighorn basins of Wyoming. (Courtesy of U. S. Bureau of Agric. Economics.)

this Arizona district there were also about 450,000 orange trees in 1930, mostly too young to bear fruit, 600,000 grapefruit (pomelo) trees, also mostly too young to bear, 15,000 lemon trees, 8,000 olive trees, 5,000 pecan trees, and over 16,000 date palms, nearly all too young to bear; while in Yuma County, Arizona, there were 1,400 more date palms. This is a small number, however, compared with the nearly 100,000 date palms in the adjacent Coachella and Imperial Valleys of California. But more important in the Imperial Valley are the 700,000 grapefruit trees.

The Imperial and Salt River Valleys are also the greatest vegetable-producing districts in the Grazing and Irrigated Crops Region. As previously noted most of the early Iceberg lettuce, the consumption of which in winter has become more common in eastern cities than was consumption of lettuce in summer a quarter century ago, is grown in these valleys. From 50,000 to 75,000 acres are devoted each winter to the lettuce crop, all irrigated, for the annual rainfall is only 4 to 8 inches. The production of 6 to 8 million crates is enough to fill 18,000 to 25,000 refrigerator cars, which would make a train 180 to 250 miles long. The acreage in cantaloupes in the two valleys is about as large as that in lettuce. The production of 8 to 10 million crates would fill another train 200 miles long. The high mountain valleys in Colorado have now become important late (summer) lettuce-producing districts

(600,000 to 1,000,000 crates), and the Arkansas Valley in Colorado (Rocky Ford locality particularly) is the nation's greatest late cantaloupe-producing district (2,000,000 crates).

The other principal vegetable-producing districts in the Region are the South Platte Valley, Colorado, especially the portion near Denver, the Salt Lake-Ogden district in Utah, the Boise-Payette district in Idaho, the Yakima Valley in Washington, and, of greater importance, the lower Rio Grande and "Winter Garden" districts in southern Texas. There is also a little production in the Rio Grande Valley for a few miles north and south of El Paso, Texas; and in several valleys of western Colorado. In the Denver district, cabbage, onions, sweet corn, and tomatoes are important crops; while the "Winter Garden" district is the great Bermuda onion producing center of the United States. Late onions are an important crop also in western Colorado.

FIGURE 324.—A roundup in southeastern Arizona. Note the short grass vegetation. (Courtesy of U. S. Bureau of Agric. Economics.)

PASTURES

About eighty per cent of the land in the United States portion, at least, of the Grazing and Irrigated Crops Region is grazed, as compared with three per cent in crops, yet it is doubtful if the value of the pasturage is half as great as that of all crops. It is for the most part desert range with so low a carrying capacity that 25 to 50 acres, indeed, on much of it, 75 acres, are required to carry an animal unit (beef cow) (Fig. 323). The pasture and range in the United States portion is estimated to have carried less than 25,000,000 animal units in 1919, during seasons ranging from 2 to 12 months long, or the equivalent of 17,400,000 animal units for a year.[8] The animal products of the region had a farm value of about $360,000,000 in 1924, and of $400,000,000 in 1925[9] as compared with feed crops in 1924 having a farm value of about $225,000,000. It is probable that more feed is shipped out of the region than is shipped in; but even after a reasonable allowance is made for such surplus feed, it appears that the value of the pasturage, including that of irrigated pastures, was $150,000,000 to $200,000,000.[10]

[8] U. S. Dept. of Agriculture, Yearbook for 1923, p. 369.

[9] Farm Value, Land Income, and Cash Income from Farm Production. Part I. Estimates by States. Section 2; Preliminary Report, Bureau of Agric. Econ., 1930.

[10] W. R. Chapline, Chief, Division of Range Research, U. S. Forest Service comments on this

This is about two-fifths of the value of all crops, and gives an average return per acre from grazing of only about 35 cents. It is probable that the return per acre of grazing land in the Mexican portion of the Region is still smaller.

There are three main classes of natural vegetation in the Region—forest, grassland, and desert shrub (Fig. 272—Oct., 1931, issue, ECON. GEOG.). The forest, which is practically confined to the high mountains and plateaus, is in some places so dense (lodge-pole pine, spruce, and fir) as to afford little light for the growth of grasses and other forage on the forest floor. However, there are many open glades and wet meadows between the belts of forest that may afford excellent feed. Where the rainfall is less, the forests change to woodlands, the larger trees giving place to pinon-juniper, evergreen or other oaks and oak-brush, and other types affording plenty of light but associated with inadequate moisture for more than a scattering growth of bunch grasses and other herbaceous forage plants.

The grassland types of vegetation provide most of the forage in the Region. Nearly all the Great Plains portion of the Region is clothed with a short-grass vegetation, commonly with grama grass (*Bouteloua gracilis*) dominant in the north, and buffalo-grass (*Bulbilis dactyloides*) more important farther south. In western Texas south of the Panhandle, buffalo grass is replaced by curly mesquite grass (*Hilaria belangeri*) which is very similar. In the highlands of southeastern Arizona, also, mesquite grass is common (Fig. 324). Large areas of short grass are also found on the higher plateaus of western New Mexico and northern Arizona, and around the Blue Mountains of eastern Oregon, below the forests.

FIGURE 325.—Typical sage brush (black sage —*Artemesia tridentata*) in the Minidoka Project, Snake River Plains, before the land was irrigated. Such land is cleared by use of a drag consisting of a steel rail. Sage brush vegetation, with only a little grass between the plants, characterizes most of the lower-lying land of the Grazing and Irrigated Crops Region as far south as southern Nevada (see Fig. 272). (Courtesy of Bureau of Reclamation, U. S. Dept. of the Interior.)

But most of the land in the Grazing and Irrigated Crops Region west of the Continental Divide, other than the land in forest on the mountains, is covered with characteristic desert vegetation. Sagebrush, principally black sage (*Artemisia tridentata*), is dominant in this vegetation as far south as southern Nevada (Fig. 325), except that in the more alkaline soils shad scale (*Atriplex confertifolius*) and

statement as follows: "our study of the problem indicated that nearly 77 per cent of the feed of all of the livestock in the West as of 1925 was furnished by pasture and nearly 70 per cent by range pasture including of course range pastures within farms. The cash value of this pasturage it is true is far less than the cash value of hay and other crop feeds so that from this standpoint your statement is doubtless correct. In other words the cash value of 8 months grazing is often $1.50 to $2.00 per animal unit yet the hay that would be fed during the balance of the year might run from $6.00 to $12.00 or even more per animal unit. There is question in my mind as to whether the difference in feed value of these two amounts fed and of the livestock production is as great as this cash value would indicate."

FIGURE 326.—Desert vegetation, in the Salt River Valley, Arizona, with irrigated land beyond the fence. The plants in the foreground are grasses (*Hileria*, probably) and composites, while the leafy bushes to the right and left of the center are *Franseria*, probably. The tall bush at the left is a Palo Verde (Parkinsonia), and between it and the giant cactus (*Carnegiea gigantia*) is a single creosote bush. To the right of the cactus is a mesquite bush (sometimes a tree in size). Note that the ground is mostly bare between the shrubs. The carrying capacity of such range is very low. (Courtesy of Bureau of Reclamation, U. S. Dept. of the Interior.)

other salt bushes become dominant. From here southward, and extending over into the Rio Grande Valley, creosote bush (*Covillea glandulosa*) becomes the dominant desert plant (Fig. 326). Both sagebrush and creosote bush are almost non-edible, but in the spaces on the desert floor between these bushes, bunch grasses and other edible plants grow and provide feed, the quantity of which varies with the rainfall. In Mexico the creosote-bush type of vegetation diminishes as the altitude of the plateau increases toward the south and west, giving place to grassland at the higher altitudes and in moister portions of the plateau, and to forests in the mountains.

Differences in climatic conditions as well as in type of vegetation cause wide variations in the seasonal utilization of the range (Fig. 327). The Alpine pastures are used only in the summer, and even at the lower elevations in the national forests the cattle and sheep have gone to lower levels by early October. They are then likely to pass through a belt of grassland or desert shrub which is used principally in the spring and fall, and by late fall have reached the truly desert lands, generally at relatively low elevations, where there is enough snow in winter to provide water for sheep at least, and in many localities for cattle. Probably more animals, however, spend the winter on pastures or in feed lots in the irrigated areas. The migrations from the mountains to the deserts in the fall, with a return trip in the spring, are relatively less important than in the past, as the irrigated area

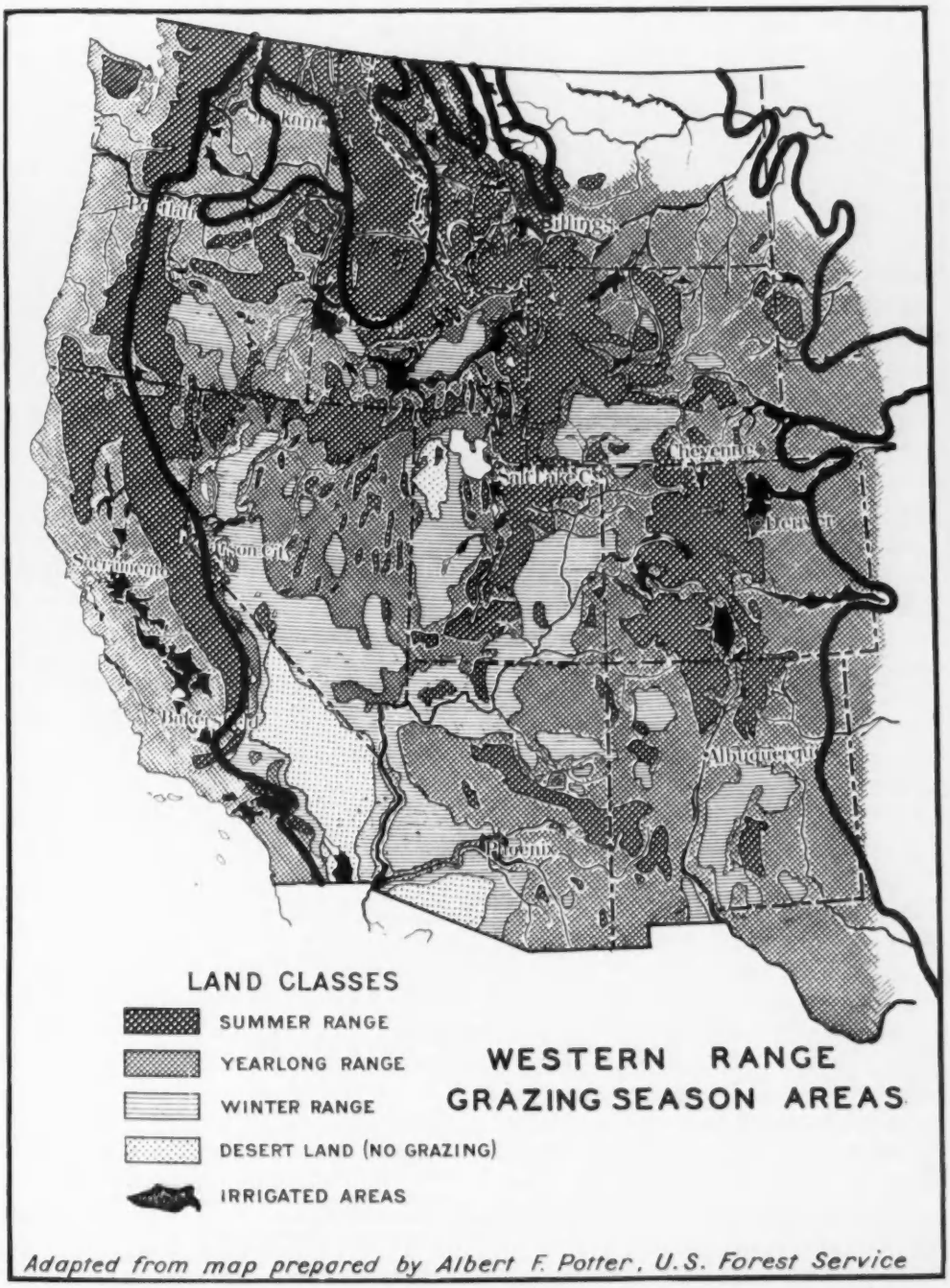


FIGURE 327.—The summer range is in the mountains of Colorado, on the Mogollon Mesa of Arizona, in the high plateaus and mountains of Utah, western Wyoming, and Montana, and in much of Idaho, also in the Blue Mountains of Oregon, and the highlands of northern Nevada. The year-long range is in the Great Plains and on the lower plateaus. The winter range is in the deserts, generally areas of relatively low elevation. In southeastern California and southwestern Arizona there are about 40,000,000 acres too dry to be grazed. The map was prepared many years ago, and some changes may have occurred since. (Courtesy of U. S. Forest Service.)

increases and agriculture becomes more sedentary. Probably the overgrazing of the desert areas, particularly, and the decreasing amount of feed available on the open range, is playing a part in the declining magnitude of the annual migrations. However, the increasing carrying capacity in the national forests, resulting from regulated grazing, is likely to increase the migration from the irrigated districts to the forests in the spring and the return in the autumn. In the Great Plains portion of the Region south of central Montana, and in much of New Mexico, eastern Arizona, eastern Nevada, and eastern Oregon, the use of the range has been year long from the beginning, with supplementary feed of hay or grain in the winter. Here, also, however, the livestock industry is becoming more sedentary with the passing of public lands into private ownership, in one way or another, and the consequent fencing in of the range.

It is interesting to note that the breaking up of many large livestock ranches into much smaller homestead holdings along the eastern margin of the Region, and the planting of part of the land to crops, although it has reduced the pasturage acreage, has usually not reduced the number of animal units where dry farming is successful. Enough feed crops are grown to balance or more than balance the loss in pasturage. But where dry-farming has been a failure and the bare fields have been abandoned, a great decrease in the carrying capacity of the range has taken place. It is doubtful if such fields will become clothed with the natural vegetation and recover their original grazing value within 25 to 50 years.

LIVESTOCK

In years past the Grazing and Irrigated Crops Region was noted principally for its large cattle ranches, the home of the cowboy, with his fancy high-heeled boots and embossed saddle, and for its wandering bands of sheep, often attended by a lonely Basque shepherd, with an occasional "war" between cattlemen and sheepmen, in which sometimes human life was taken.[11] But now

TABLE I

ESTIMATED VALUE OF ANIMAL PRODUCTS, UNITED STATES PORTION OF GRAZING AND IRRIGATED CROPS REGION AS APPROXIMATED BY MONTANA, IDAHO, WYOMING, COLORADO, NEW MEXICO, ARIZONA, UTAH, NEVADA, AND WASHINGTON, 1924–1928 *

	1924	*1925*	*1926*	*1927*	*1928*
Cattle	$82,197,000	$85,058,000	$89,716,000	$100,547,000	$123,414,000
Calves	10,253,000	11,661,000	12,586,000	14,174,000	16,260,000
Milk	85,050,000	93,996,000	100,300,000	106,157,000	113,318,000
Sheep	10,718,000	12,525,000	12,767,000	15,847,000	17,066,000
Lambs	49,973,000	57,831,000	58,717,000	49,378,000	59,751,000
Wool	40,866,000	43,978,000	39,530,000	36,765,000	44,784,000
Hogs	31,732,000	43,797,000	44,711,000	39,440,000	37,228,000
Chickens	13,225,000	15,138,000	18,036,000	17,762,000	17,527,000
Eggs	32,661,000	41,555,000	41,428,000	40,595,000	44,782,000
Total	$356,675,000	$405,539,000	$417,791,000	$420,665,000	$474,130,000

* From "Farm Value, Land Income, and Cash Income from Farm Production, Part I, Estimates by States, Section 2, Preliminary Report," Bureau of Agric. Econ., Washington, 1930.

[11] The better part of the public domain was, in general, occupied by cattlemen before the sheepmen came (compare Figs. 279 and 280), but as wool production and, later, lamb production, was found profitable, the sheep tended to press in on the cattle range. As most of the range was government property and could not be fenced, not even the right of possession was recognized, partly because the area grazed by the cattle often could not be clearly distinguished. The wandering shepherd, caring little for the future of the range, often allowed the sheep to graze the range so closely that cattle could find little to live on for months afterward. It frequently became a question of whether the sheep or the cattle would starve. Such conditions, in the absence of government authority, sometimes led to a struggle to the death.

FIGURE 328.—Cattle grazing near the margin of the Madison National Forest in southwestern Montana. The most popular beef breed in the west is the white-face Hereford. Note the small sage bush vegetation in the foreground and the forests (Engelmann Spruce) on the mountain slopes. (Photo by K. D. Swan, Courtesy of U. S. Forest Service.)

many old cattle ranches have been broken up by homesteaders or by sales to small farmers, and with the expansion of the irrigated area, the ranching industry has decreased, not only relatively but absolutely. In the United States and Canadian portions of the region at least, the family farm is the typical unit of agricultural organization, rather than the large cattle ranch with several employees, or the sheep outfit. This change is registered in the relative importance of the animal products. The annual value of the milk, poultry, eggs, and pork produced in the region, products which the old cattleman viewed with contempt, is now almost twice as great as the value of the cattle produced, including even dairy cattle, and is about equal to the combined value of the cattle, lambs, and wool (see Table I). The evolution of agriculture in the region is a splendid illustration of peaceful penetration and subjugation by the small farmer, under conditions of great difficulty, both physical and social.[12]

The Grazing and Irrigated Crops Region is an area of surplus production, at least the United States portion, for all animal products except pork and lard, and, locally, for milk and butter. This is owing not only to the vast extent of the pasturage of low production and the relatively sparse population, but also to the location of the region near the continental divide with reference to the flow of farm products, and the consequent necessity of condensing its bulky hay and other feed crops into products having a value per unit of weight sufficiently high to bear the cost of transportation to distant markets. Animal products have a value per pound normally many fold that of plant products and meet this need of the region. The animal products now have a total value probably exceeding that of all the

[12] W. R. Chapline of the United States Forest Service notes: "Your sentence regarding the 'evolution of agriculture' as it applies to irrigated lands is true. As mentioned above, however, I do not believe that it is true in any but very minor instances under dry farming conditions in the part of the range country which I know most about. In fact the attempts at homesteading for dry farming have had very serious social and economic consequences in any number of areas that I might mention in the West. Many of these settlements went bankrupt shortly after the War, though the abandonment continued for several years. As Professor Shephard of North Dakota stated two years ago at Miles City, the situation was then acute in western North Dakota. In eastern Montana this last summer the farm abandonment was unusually great."

crops, and since considerably over half the crops are fed to livestock, the value of animal products sold from farms is probably more than double that of all plant products sold. A larger and larger proportion of the animal products are being shipped to the Pacific Coast, principally California, where population is increasing at a more rapid rate than in the Eastern states.

FIGURE 329.—Sheep grazing on the plateau in Arizona. Note the white sage and rabbit brush vegetation in the foreground, with some grass between, the piñon pine and juniper trees on the right, and the too close formation of the sheep. (Photo by W. S. Cline, Courtesy of U. S. Forest Service.)

Cattle are raised in the region both for meat and for milk, and these two aspects of the industry are now of about equal importance. Relatively few of the cows on the large cattle ranches are milked, but there are many small farmers, particularly those who have some irrigated pasture and hay land, who produce both beef and milk, and in the irrigated districts are other farmers who have developed fine dairy farms and produce practically nothing but milk. The beef cattle are most numerous in the grassland areas of the Great Plains and on the plateaus of Arizona and eastern Oregon. There are also many beef cattle in the high mountain valleys of Colorado, Utah, and western Montana (Fig. 328), and in many irrigated areas, particularly on January 1, when the census was taken (see Fig. 281). Dairy cattle, on the other hand, are practically confined to the irrigated lands. A dairy cow cannot range over hundreds of acres of land providing only very sparse feed and retain enough energy to produce a profitable quantity of milk. The major centers of dairy production are, therefore, the large irrigated areas, *i.e.*, the South Platte and other valleys in Colorado, especially the Denver district, the Utah oases, the irrigated districts on the Snake River Plains in Idaho, the Yakima Valley in Washington, the many irrigated valleys in Montana and the few in Wyoming and in eastern Oregon; also, notably, the Salt River Valley in Arizona and the Imperial Valley in California. In these irrigated areas some of the finest dairy cows in the nation are to be found, and a development of dairying as intensive as in Wisconsin.

The relation of the Grazing and Irrigated Crops Region to the Corn Belt in the production of beef and mutton deserves notice. The range region is a vast breeding ground for beef cattle and sheep. Most of the land can be used only for pasture and much of that which could be dry-farmed is too remote from the railroad; consequently the region provides cheaper feed for young cattle and lambs than can be found elsewhere. But corn and other crop feed suitable for fattening the animals are cheaper in the Corn Belt. Consequently millions of young steers, and some of lambs are shipped each season to the large markets in the Corn Belt and elsewhere to be

bought by farmers who have corn and other grain to feed. From the farms of the Corn Belt the cattle and sheep are shipped to the large markets at Chicago, Omaha, Kansas City, and other points, and, after slaughter, move on in refrigerator cars to the distributing points in the eastern and southern states.

The swine, like the dairy cattle, are found almost exclusively where there is irrigated land or in the few areas where dry-farming is possible. Hogs must have concentrated feed, and are, therefore, very largely dependent on crops rather than pasture. The relatively few hogs in the region, compared with the Corn Belt and many other Eastern areas, are largely concentrated in the South Platte Valley of Colorado, in the valleys and piedmont slopes of Utah, in the irrigated areas of the Snake River Plains, in the Yakima Valley of Washington, and in the irrigated valleys of Montana and of Northern and Southeastern Wyoming. Unlike dairy cattle, there are very few hogs in the region south and west of a line from Brownsville, Texas, to Santa Fé, New Mexico; Salt Lake City, Utah; Boise, Idaho; and the Dalles, Oregon. Most of this southwestern portion of the region is cattle and sheep range (Fig. 326), with little water available for irrigation, except in the Salt River and Imperial Valleys, and there are few hogs even in these two irrigated districts, perhaps because of the summer heat.

Sheep are found everywhere in the region, except in the driest parts of the desert of southwestern Arizona, southeastern California, and northwestern Sonora, in the dense forests of northern Idaho, northwestern Montana, and northeastern Washington, and in the national parks.

TABLE 2

FARMS CLASSIFIED BY TYPE, NUMBER, AND ACRES OF FARM LAND AND CROPS HARVESTED PER FARM, 1930—ARIZONA, NEW MEXICO, UTAH, AND NEVADA

Type of Farm	*Arizona*			*New Mexico*			*Utah*			*Nevada*		
	Number of Farms	*Total Acres per Farm*	*Acres of Crops Harvested per Farm*	*Number of Farms*	*Total Acres per Farm*	*Acres of Crops Harvested per Farm*	*Number of Farms*	*Total Acres per Farm*	*Acres of Crops Harvested per Farm*	*Number of Farms*	*Total Acres per Farm*	*Acres of Crops Harvested per Farm*
All Types	14,173	743	34	31,404	981	48	27,159	207	43	3,442	1,186	115
General	979	122	25	3,305	300	52	5,400	119	42	440	252	60
Cash-grain	195	106	51	2,942	423	173	1,609	335	116	36	173	79
Cotton	2,747	134	90	2,873	105	57	.....	...	..	...	...	...
Crop-specialty	641	154	64	4,291	312	69	4,005	109	50	642	562	125
Fruit	487	69	28	429	96	25	990	40	18	15	174	11
Truck	448	120	74	728	32	11	725	37	19	42	91	31
Dairy	745	128	32	639	485	52	3,373	98	38	499	191	62
Animal-specialty	322	156	44	839	352	60	2,106	164	62	137	297	91
Stock-ranch	3,660	2,446	11	5,906	4,095	24	2,388	1,204	74	822	3,941	271
Poultry	625	97	7	242	185	23	1,830	38	14	232	80	21
Self-sufficing	704	105	8	3,749	108	10	922	70	15	122	121	14
Abnormal	1,598	178	8	3,392	168	9	3,183	47	11	274	197	25
Institution or Country-estate	28	133	40	25	2,511	16	8	....	....	12	204	42
Part-time	1,382	145	5	3,212	136	9	3,078	46	10	232	125	13
Boarding and Lodging	50	1,194	7	20	490	9	17	33	4	6	....	....
Forest-product	98	54	3	79	358	12	....	....	....	....	....	....
Horse farm, feed lot or livestock dealer	40	231	98	56	396	48	80	86	50	24	799	144
Unclassified	1,022	319	9	2,069	524	15	628	150	12	181	770	35

Census: Agriculture, third series, type of farm.

FIGURE 330.—A homestead on the Yuma irrigation project on the Yuma Indian Reservation in southeastern Arizona. It is probable that many of the part-time farms reported by the census are partially developed farms of this kind, the owner working at other jobs to obtain money to develop the farm. (Courtesy of Bureau of Reclamation, U. S. Dept. of the Interior.)

There are very few sheep along the Mexican border, largely because the feed is too dry. The concentration in some counties that afford little else than desert range appears to be as great as in most of the irrigated areas, even on January 1, when the census was taken (Fig. 282). In the production of wool, however, many irrigated areas, notably those in Utah and southern Idaho, stand out more clearly. But the South Platte Valley, in Colorado, which has hundreds of thousands of sheep on feed in January, produces little wool. This may be because it is the greatest lamb-feeding district in the nation. Other lamb-feeding districts are located in Nebraska, Iowa, and northern Missouri, indeed, as far east as Ohio.

There are many goats also in the Region, principally in the Mexican portion and in the Edwards Plateau of southwestern Texas. This is a remarkable area in that goats, sheep, and cattle graze together on the same land (see ECON. GEOG., Oct., 1931, p. 363).

The Region has been noted for its horses, particularly riding horses—not for their size as much as for their stamina. In the old days endurance was a first essential in riding the range. Later draft horses were brought into the irrigated farming districts to provide power in plowing the ground and cultivating the crops. But with the coming of the automobile and tractor the number of horses has diminished rapidly, the decline having been nearly 20 per cent between 1925 and 1930.[13] But the very low prices for farm products since 1929 do not leave farmers enough money, after interest payments and taxes are met, to buy expensive machinery, and if these low prices continue, the demand for horses and later the number may increase within a few years.

SYSTEMS OF FARMING

The agricultural returns of the 1930 census are being tabulated for the first time by type of farm, determined on the basis of the relative importance of the value of the several crops, livestock, and livestock products sold or traded. All farms are classified into twelve types (the limit set by the punch card), with the abnormal type divided into five subtypes, while the farms that resist classification are included in an "unclassified" group. Although these census tabulations are available at the time of writing for only four states in the Grazing and Irrigated Crops Region, it seems worth while to base this brief discussion on these data. Table 2 shows the number of farms in each type, the total acres per farm, and crop land harvested per farm.

[13] In 1918 the average price of horses in the Region was nearly $100. By 1932 this had fallen to about $33.

FIGURE 331.—An orange orchard and irrigating ditch in the Salt River project, Arizona. An umbrella tree is shown on the right, a fan palm on the left, with a corner of the one-story house beyond. This is a typical view in the well-developed sections of the Salt River and Imperial Valleys. (Courtesy of Bureau of Reclamation, U. S. Dept. of the Interior.)

In Arizona the most numerous types of farm are the stock ranch, the cotton farm, and the part-time farm. The stock ranch includes those farms in which the sales of beef cattle, sheep, hogs, wool, mohair, and slaughtered animals exceeds 40 per cent of the value of all products of the farm. With cotton farms, similarly, the sales of cotton and cotton seed exceed 40 per cent of the value of all farm products. Part-time farms are those in which the operator "spent 150 days or more off the farm, in other than farm work, or reported an occupation other than farmer, provided the value of products did not exceed $750." The stock ranches were located almost wholly in the grazing areas, whereas practically all the cotton farms, and most of the part-time farms, are irrigated. The stock farms, it will be noted, averaged nearly 2,500 acres of farm land, but only 11 acres of crops harvested, whereas the cotton farms averaged 134 acres of farm land, of which 90 acres were in crops. The part-time farms had on the average 145 acres of farm land, but less than 6 acres of crops. In many cases, doubtless, these are partly developed farms, with the operator engaged temporarily in another occupation (Fig. 330).

The most common other types of farms are "general" farms, "dairy" farms, "self-sufficing" farms, "crop specialty" farms, and "poultry" farms, with a somewhat fewer num-

ber of "fruit" farms, "truck" farms, and "animal specialty" farms. General farms are those in which the sale of products from any one source was less than 40 per cent of the total value of all products, dairy farms those in which the sales of milk and dairy products, including dairy cows and calves, were over 40 per cent. Self-sufficing farms are those in which the value of products used by the operator's family was 50 per cent or more of the total value of all products of the farm. Crop specialty farms are those in which the sales of beans, peas, tobacco, hay, potatoes, and other crops than grain, cotton, fruit, or truck aggregated more than 40 per cent of the value of all products. In Arizona these were mostly hay, potato, or bean farms. Poultry, fruit, and truck farms are defined by the 40 per cent ratio for each of these products; while animal specialty farms are distinguished from stock ranches by the fact that there is more than one acre of crops to 10 acres of pasture. The general farms and self-sufficing farms are found mostly in the irrigated and dry-farming districts, while the dairy, fruit, truck, poultry, animal specialty, and crop specialty farms are located mostly in the irrigated areas, notably in the Salt River Valley (Fig. 331).

In New Mexico stock ranches are, likewise, the most numerous type of farm, but crop specialty farms (mostly hay and bean producing) rank second in number, with self-sufficing farms third. General farms are fourth in number, followed closely by part-time farms, cash-grain farms (mostly outside the Grazing and Irrigated Crops Region), and cotton farms. Dairy, poultry, fruit, and truck farms are relatively less important than in Arizona, while animal specialty farms (mostly on irrigated land) are relatively more important. The large number of self-sufficing farms is undoubtedly explained by the large Mexican and Indian population.

In Utah general farms are most numerous, followed by crop specialty farms (largely producing sugar beets, hay, or alfalfa seed). Dairy farms rank third in number and part-time farms fourth. Half of these part-time farms are in the densely settled area that extends from Brigham through Ogden and Salt Lake City to Provo, and doubtless are, for the most part, semi-suburban homes of factory workers, business and professional men, who have a garden, keep chickens and, possibly, a cow, which produce products exceeding $250 in the aggregate, thereby meeting the census definition of a farm.[14] This type of farm has been increasing rapidly in recent years in nearly all industrial or densely populated districts, and further increase appears likely, particularly if the unemployment problem persists, or the regular work-day becomes shorter. Such part-time farms reduce the cash cost of living and provide a reserve against adversity.

Stock ranches in Utah rank fifth rather than first in number among the types of farm, indicating the great importance of irrigation in the state. There are nearly as many animal specialty farms, and also poultry farms, as stock ranches. Cash-grain farms (mostly on dry land) rank eighth in number and much fewer are the fruit, truck, and self-sufficing farms. Although the

[14] The returns on the "Incidental Agricultural Production" schedule indicate that there are hundreds of other suburban or similar places which meet the census definition of a farm, but were not enumerated on the regular farm schedule.

farms are small in Utah, nearly all are commercial in character, except the part-time farms.

In Nevada, where there is relatively little irrigated land, stock ranches are more numerous than other types of farms, with crop specialty farms, mostly producing hay for the stock ranches, second in number. Dairy farms, located mostly in the irrigated districts rank third, and general farms fourth. Much less numerous are poultry

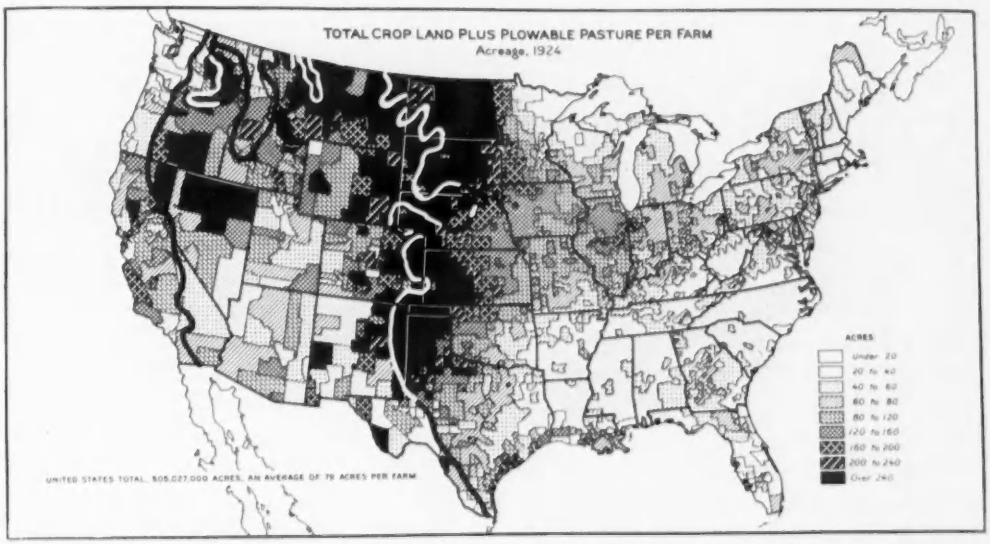


FIGURE 332.—The crop and plowable pasture acreage owned by the operator averages largest in the Great Plains portion of the Grazing and Irrigated Crops Region, and in northern Nevada and southeastern Oregon. The area of such land per farm is smallest in Utah and Arizona, but in many cases these constitute merely the farmsteads of ranchers who use the range for miles around. The map does suggest a lesser willingness to acquire ownership of land in the arid southwestern half of the Grazing and Irrigated Crops Region, probably because the land is being grazed at present and is not worth the cost of acquiring ownership. (Courtesy of U. S. Bureau of Agric. Economics.)

per cent of the farmland of the state and include 66 per cent of the crop acreage.

These types of farming statistics reveal the great importance of irrigation in the agriculture of the Grazing and Irrigated Crops Region, and a surprising number of part-time farms.

SIZE AND TENURE OF FARMS

In all the Grazing and Irrigated Crops Region, excluding the Mexican portion, there are about 230,000 farms, or only as many as in Ohio or Kentucky, although the area is 23 times as great as that of either state. Obviously the farms must be very large in area, or else there must be much land not in farms. Both are true. Two-thirds of the land is not in farms, and some of the farms are very large in extent—20,000 over 1,000 acres in area. Moreover, flocks

farms, animal specialty farms, and self-sufficing farms, with fruit, truck, and cash-grain farms almost negligible in number. Although Nevada is of all states perhaps most exclusively the range state, it is interesting to note that stock ranches constitute only a fourth of all farms, and with animal specialty and dairy farms added, less than 40 per cent of the total. However, they operate 84

and herds from these large farms, and from other farms too, graze much of the land not in farms. But some farms are very small in extent —66,000 having less than 50 acres. However, measured in value of products many of these small farms, which are irrigated and grow high-value crops per acre, are as large as the large farms, possibly will average larger. Area of the farms, therefore, means little unless it is considered with reference to irrigated land, dry-farming land, or grazing land, and if irrigated it must be considered with reference to crops grown.

In the Northern Great Plains portion of the Region more than one-third of the 50,000 farms are under 175 acres in area, nearly all irrigated. On the other hand, more than a third are over 500 acres in area, mostly dry-land farms and livestock ranches (Fig. 332). More than a fourth are 260 to 500 acres in extent, and are probably dry-land farms mostly, though to utilize modern grain seeding and harvesting machinery effectively a farm three to five times this size is desirable. In the southern plains sub-region the proportion of the farms that fall into the several area groups is almost the same as in the Northern Plains.

In the Southern Rocky Mountain sub-region two-thirds of the farms are under 175 acres in area, while only a seventh are over 500 acres. There is relatively more irrigation and much less dry farming in this sub-region than in the Great Plains, and much of the grazing land is in the national forests and not within the farms as on the Plains. In the Utah and eastern Idaho section of the Rocky Mountains the proportion of the farms that are small (under 175 acres) is still greater, about 80 per cent, while only 6 per cent of the farms have over 500 acres. Nearly half are under 50 acres. Mormons have large families, and as their parents and grandparents were the earliest Anglo-Saxon settlers in the Grazing and Irrigation Crops Regions, there has been rapid increase of population with much sub-division of farms. In some counties, as a consequence of the desire to distribute both good and poor land equably among the heirs, and because of marriage, many farms consist of several parcels of land, sometimes six or eight each of only an acre or two, separated by a mile or more. In only two or three generations there has arisen the scattered small field system that existed in Europe during the Middle Ages, and still exists in parts of Europe and much of the Orient.

In the northern Rocky Mountain sub-region, including the Blue Mountain section of Oregon, the proportion of the farms under 175 acres sinks again to 50 per cent, and even to 40 per cent in western Montana, while the proportion over 500 acres rises to 25 per cent. Here there is a little dry-farming, while many of the irrigated farms include much non-irrigated land. It is not surprising, therefore, to find that nearly a third of the farms are between 175 and 500 acres in size.

In the outliers of the Grazing and Irrigated Crops Region in central Washington and south-central British Columbia the proportion of the farms that are under 175 acres rises almost as high as in Utah, but for a different reason. Fruit growing is the dominant enterprise in these irrigated valleys, and a 20-acre apple orchard may be a larger business than a 1,000 acre stock ranch. Less

than 3 per cent of the farms in this sub-region exceed 1,000 acres in area. In the Snake River Plains sub-region likewise the proportion of farms under 175 acres in extent is high—about 85 per cent—while the proportion over 1,000 acres is only 5 per cent. This also is a sub-region of intensive irrigated agriculture. However, the most numerous size groups are those of 100–175 and 260–500 acres.

In the Great Basin to the south, a sub-region noted for its vast stock ranches, it is a surprise to find only 10 per cent of the farms exceeding 500 acres in area, while over 60 per cent are under 175 acres. However, much of this sub-region is in the public domain, and many ranchers who own only a small farm graze thousands of acres surrounding the home place. This is true also in the Colorado Plateaus, where only 15 per cent of the farms reported an area exceeding 500 acres, while nearly 40 per cent reported less than 50 acres. But ownership of the water hole often means undisputed use of thousands of acres surrounding it. There are more farms of less than 3 acres in Arizona than in any other state, and many of these are merely parcels of land that include a well or a water hole.

In the Sonoran Desert, where practically all the farms are irrigated, it is interesting to note that two-thirds of the farms are under 100 acres in extent, and less than 4 per cent exceed 500 acres. In Imperial County, California, a representative sample of the sub-region, there were 39 farms under 3 acres, 153 of 3 to 9 acres, 210 of 10 to 19 acres, 810 of 20 to 49 acres, 840 of 50 to 99 acres, 621 of 100 to 174 acres, 159 of 175 to 259 acres, 230 of 260 to 499 acres, 91 farms of 500 to 999 acres and 33 farms exceeding 1,000 acres in area. Since the soil is quite uniform and most of the land is cultivated intensively, it is clear that the farmer as well as the soil and the type of farming determines the size of the farm. There are as great differences in the capacity of men as there are of land.

LAND OWNERSHIP AND TENANCY

The agriculture of the Grazing and Irrigated Crops Region is young, consequently the proportion of the farmers who are tenants is low. Many of the farmers homesteaded their farms, others bought land in irrigation projects, and the passage of time has not yet permitted a large proportion of their children to move to town and rent the inherited farm. Another important factor is the type of farming. Neither livestock ranching on the grazing lands nor dairying in the irrigated districts is well adapted to tenant operation. Few tenants have enough capital to own all or half the livestock, and without a personal interest in the stock there is danger of depreciation—animals cannot endure misuse so well as land. This also is true of fruit, which is the dominant type of farming in several irrigated areas. An inexperienced tenant could do more harm to a fruit orchard than the owner could repair in many years.

In the Grazing and Irrigated Crops Region as a whole, 60 per cent of the farmers own all the land they farm, while 17 per cent rent some land in addition to that which they own. Less than a fourth of the farmers are tenants, as compared with over two-fifths in the nation as a whole. In the Great Plains portion of the Region over a half of the farmers are

full owners and a quarter part-owners. In the Southern Rocky Mountain sub-region 70 per cent are full owners and 10 to 15 per cent are part owners. In the Utah valleys the proportion is similar, but here another factor exerts an influence, namely, that many of the farms are too small to support two families. The willingness of the Mormon Church to make loans at favorable rates to young men of good character is the fourth factor that retards the rise in tenancy in Utah and southern Idaho.

In the Northern Rocky Mountains sub-region, the proportion of farmers who are full owners falls to about 60 per cent. But part-owners are almost as numerous as tenants. In the Washington-British Columbia fruit valleys 65 per cent of the farmers are full owners, and 12 per cent are part-owners. In the Snake River Plains the proportions are 60 per cent and 12 per cent, respectively. In the Great Basin, predominantly a live-stock country, 70 per cent of the farmers are full owners and 11 per cent part-owners. About the same proportions exist in the Colorado Plateaus. But in the portion of the Mexican Plateau in the United States, where cotton has become an important crop, the proportion of farmers who are full owners falls to less than half, in fact, tenants are almost as numerous as full owners. Likewise, in the irrigated areas of the Sonora Desert, where cotton and truck crops are very important, only a little over half of the farmers are full owners, while over a third are tenants.

Managers in most of the Grazing and Irrigated Crops Region operate only 1 to 2 per cent of the farms, but in the Central Washington Valleys, where fruit is important and tenancy is low, the proportion rises to 4 and 6 per cent; and in the Great Basin, where stock ranching is the dominant type of farming, the proportion is 6 to 7 per cent. In Imperial County, California, nearly 20 per cent of the farms were reported as operated by managers in 1930, but this is owing to a state law that forbids Orientals from either owning or renting land. Consequently they manage the farms for the owners.

THE PEOPLE

The population of the United States portion of the Grazing and Irrigated Crops Region is about 3,500,000, of the Canadian portion less than 100,000, and of the Mexican portion (including the probably humid portion of the Plateau) between 8,000,000 and 9,000,000. In the Mexican portion probably a third or more of the people are pure Indian, more than a half of mixed race (mostly Indian) and, possibly, a tenth pure white. In the United States portion, on the other hand, there are only about 105,000 classified by the Census as Indians. But there are probably 275,000 Mexicans, many born in the United States, and 17,000 Orientals, mostly Japanese, also 27,000 Negroes. Mexicans are almost confined to Colorado, New Mexico, Arizona, and the California portion of the Region. The Orientals are principally in the California portion, with a few thousand in Utah and Colorado, while most of the negroes are in Colorado and Arizona. Over 90 per cent of the people in the United States portion of the Region, therefore, belong to the white race, and the proportion is even higher in the Canadian portion.

NATIONS AND STATES OF ORIGIN

Practically every nation of Europe, however, as well as every state in the United States, is represented in the white population. Over thirty thousand were born in England, and there are 110,000 more persons one or both of whose parents came from England. Ten thousand were born in Scotland and about the same number in the Irish Free State; but whereas there are 30,000, one of whose parents was Scotch, there are over 40,000 such children of an Irish parent or parents, indicating probably an earlier migration or a higher fertility. Over 60,000 came from Scandinavia, and 120,000 more had a parent born in Scandinavia. Nearly 30,000 were born in Germany and 100,000 more are of German descent. There are over 10,000 born in Jugo-Slavia, nearly 20,000 in Russia, 75,000 born in Italy, and as many more in Canada,—mostly in Ontario and the Prairie Provinces. Other foreign countries represented by several thousand migrants each are Wales, northern Ireland, Netherlands, Switzerland, France, Poland, Austria, Hungary, Finland, Greece, Rumania, Spain, Belgium, Lithuania, Palestine, and Syria. In all, there were over 280,000 white persons of foreign birth in the Region April 1, 1930, and 675,000 native born, having one or both parents foreign-born. Persons of foreign birth or foreign parentage constitute, therefore, nearly a third of the white population. This foreign stock has helped greatly in the development of the Region—almost every nation in Europe is represented in nearly every county.

The West, like the large cities of the East, is a melting pot for Americans also, and it performs this task more efficiently, probably, than do the cities in the East, for it is the most democratic portion of the United States. In 1920 there were 25,000 persons in the Grazing and Irrigated Crops Region who were born in New England, about 100,000 who were born in the Middle Atlantic States, more than 300,000 who were born in the East North Central States, notably in Illinois, and fully 500,000 who were born in the West North Central States, mostly in Iowa, Missouri, Nebraska, and Kansas. The West South Central States, principally Texas, contributed only about 140,000, the East South Central and Pacific States each about 70,000, and the South Atlantic States 50,000. More residents of the Region were born outside the Region than in the Region, and the number born in other states was almost equal to the number born in the Region. It is probable that the pioneer days are past. Whereas the increase of population between 1900 and 1910 was 57 per cent, and between 1910 and 1920 was 27 per cent, the increase between 1920 and 1930 was only 11 per cent,—scarcely more than the excess of births over deaths, and much less than the average increase in the United States as a whole.

EDUCATION

The school statistics for 1930 indicate that the dissemination of education is more complete and prolonged in the Grazing and Irrigated Crops Region, if the Mexican infiltration along the southern margin be excluded, than in any other portion of the United States, except the Pacific States, and, possibly, South Dakota, Nebraska, and Kansas. Only in a few New England and

North Central States is there a higher percentage of children 7 to 13 years old attending school than in Utah and Idaho, and the discrepancy is only 0.1 to 0.3 per cent, which is remarkable in view of the isolation of many farms and the long distances some children have to travel to school in this Grazing and Irrigated Crops Region. In the high school years the percentage attending school is far higher in Utah, Idaho, and Nevada than in any eastern state, and is scarcely equalled by the Pacific States, which also lie partly within the Grazing and Irrigated Crops Region. This is true also for young people attending college, as indicated by statistics for the age group 18–20.

That these states should lead in emphasis on education is doubtless due in large part to the Mormon influence (the Mormon leaders were of New England origin and their successors have maintained faithfully the educational tradition); but other migrants into the Region have also been a "chosen people," for it would be mostly the ambitious and energetic who would undertake in the early days to establish a home so far from civilization. Here in the mountain valleys, on the piedmont slopes, and in the vast plains and deserts has been developed, within the brief span of two or three generations, and despite unusually adverse physical conditions, a rural culture which, measured from the combined standpoints of education, of equable distribution of wealth, of real income and standard of living, and of provision for the coming generations (birth rates) and the maintenance of civilization, exceeds that of any urban area in the United States, at least, and probably is the equal of any rural area in the world. The Pacific States slightly exceed these Mountain States in the proportion of the young people who are attending high school and college, and both the Pacific and North Atlantic States exceed them in most years in dollar income per capita, but in wealth per capita and in the equable distribution of wealth, as measured by the ownership of homes and farms by the occupants, and by the relative per capita income of the farm and non-farm population, these states stand with the Pacific States, South Dakota and Iowa at the top, and in providing children to carry on the torch of civilization the Mountain States greatly exceed the Pacific states, which are dependent upon migration from other states or immigration from abroad to prevent a rapid decline in their population a few decades hence.

ILLITERACY

About 4 per cent of the people over 10 years of age in the Grazing and Irrigated Crops Region are unable to read or write, but of the native white only 1.2 per cent, and these are mostly Mexicans and Indians. For the foreign-born white the proportion is 5.6 per cent and for the negroes 3.1 per cent. For the native white in Montana, Wyoming, and Utah the proportion is only 0.3 per cent, and for Nevada 0.2 per cent, which is lower than in any other state in the nation. One of the great tasks of the schools in the southern portion of the Region is to educate the Mexicans and the Indians. This is an especially difficult task in New Mexico, where nearly 8 per cent of the native-born population is illiterate, the highest proportion among all the states in the nation.

RELIGION

About 1,500,000 people in the Region were members of a church in 1926, or 43 per cent of the total population, and over half of the adults. More than one-third (36 per cent) of all church members were Catholics—in New Mexico 80 per cent, and in Arizona 64 per cent. Nearly one-third (32 per cent) were Mormons (Latter-Day Saints)—in Utah nearly 90 per cent, and in Idaho over 50 per cent. About 7 per cent were Methodists, 5 per cent Presbyterians, 4 per cent Baptists, 3 per cent each Lutherans and Episcopalians, 2 per cent each Congregationalists and Disciples, also nearly 2 per cent belonged to Jewish Congregations.

The influence of religion upon the trends of population is well illustrated in these figures. Both the Catholic and the Mormon churches have encouraged large families. Two-thirds of all church members in the Region belong to these churches today. From a few hundred pioneers who laboriously began to develop farms in the desert only 80 years ago, the Mormon group has grown into a people having an actual church membership of 500,000, with coöperative buying and selling associations that are models of their kind, finance institutions that have helped to keep

FIGURE 333.—"The Lord thy God bringeth thee into a good land, a land of brooks of water, of fountains and depths that spring out of valleys and hills." Deuteronomy 8: 7. Terrace Falls, Lake Chelan, Washington. (Courtesy of Bureau of Reclamation, U. S. Dept. of the Interior.)

the proportion of farms operated by tenants in Utah less than half that in most Western states, and an economic and political influence that is effective and salutary in many parts of the Intermountain country.

TREND OF POPULATION

But the pressure of population is already being felt in Utah, and many young people have left the state seeking better opportunity elsewhere. Between 1920 and 1930 the number of farms in the state under 10 acres in size nearly doubled, and those of 10 to 20 acres increased slightly, whereas those of larger size diminished, except a slight increase in those of 50–99 acres, and those of over 500 acres (dry-land farms). In Utah the population increased only 13 per cent between 1920 and 1930, in Idaho only 3 per cent, while in Montana the population actually decreased. This decrease in Montana, however, is owing largely to drought, and to progress in agricultural technique, which is increasing the size of the dry-land farms. Between 1920 and 1930 not only did farms in this state under 10 acres in area double in number, but also the farms of over 1,000 acres almost doubled, while those of 260–500 acres dropped to half the 1920 number, and those of 175 to 259 acres, and of 100–175 acres decreased notably. Most of the Grazing and Irrigated Crops Region is approaching, if it is not already reached, the saturation point relative to farm population under present trends in agricultural technique and present prices of farm products. Between 1920 and 1930 the number of farms declined 10,000 in Montana, dropped slightly in Idaho, remained about stationary in Colorado, Wyoming, and Nevada, and increased slightly in New Mexico and Utah. Only in Arizona, where there was progress in the development of a government irrigation project, did a notable increase occur in the number of farms.

The birth rate remains high, however, among the rural people of the Region, and it seems likely if this is maintained that the migration of young people from the Mountain States to the Pacific Coast regions will aid greatly in counterbalancing the deficiency in young people which will soon develop in the latter regions. In 1930 there were 649 children under 5 years of age per 1,000 women 15 to 44 years old (child-bearing age) in the farm population of Utah, 645 in New Mexico, 651 in Arizona, 571 in Idaho, and 557 in Colorado, as compared with 450 in California, 415 in Oregon, and 416 in Washington. In the cities of over 100,000 population there were 375 children per 1,000 women of child-bearing age in Utah (Salt Lake City) as compared with 235 in such cities in California, 215 in Oregon, and 246 in Washington. At the present expectation of life in the United States (60 years at birth), which is unlikely to increase very much, it requires about 370 children under 5 to 1,000 women 15 to 44 to maintain population stationary. It will be seen, therefore, that there is a great surplus on the farms of the Mountain States, and a great deficit in the cities of the Pacific Coast. About 61 per cent of the population in the Mountain States is rural and about 68 per cent of the population of the Pacific Coast states is urban.

It is fortunate for the people of the Pacific Coast that they have such excellent migrant material in much of the mountain and desert hinter-

land. But this migration means a great transfer of wealth, not only that represented in the education of children, but also that involved in the settlement of estates. How to promote a counterflow of wealth back into the rural districts is the great problem of the future. Without it the flow of young people from the farms, vigorous in health and well educated for urban labor—the real wealth of the state and nation—may depreciate in quality or slowly dry up.

NOMADIC HERDING REGIONS

Wellington D. Jones and Derwent S. Whittlesey

NOMADIC herding is the dominant and almost exclusive mode of agricultural land occupance in a vast stretch of territory in Asia and Africa that makes up perhaps one-tenth of the earth's total land surface. That the very large area thus occupied is no true measure of the real importance of nomadic herding, however, is readily demonstrated by comparing a map showing the location and extent of this type of agriculture (Fig. 1) with maps of density of population. Such a comparison reveals the fact that except for small and scattered spots of concentration, the population density of this immense area is very low. The insignificance to the world at large of the regions of nomadic herding is further emphasized by a tabulation of the names of the countries that lie within these regions; without exception the list comprises lands that have but little contact with the interdependent "commercial world" of today. Periodically in the past, however, the populations of these now unimportant lands have powerfully affected, by persistent and damaging raids, their immediate neighbors in China, India, Mesopotamia, Eastern and Central Europe, North Africa and Spain, and the Sudan. At present the tables are turned, and railroads, airplane routes, and military force are driving wedges of occidental civilization into the lands of the nomads. Even so, the conquest is not complete; the British government, for example, keeps a strong army on the Northwest Frontier of India to ward off depredations of nearby "hill tribes" of nomadic herders.

The Livestock Association

As the name "nomadic herding" suggests, this type of agriculture consists almost wholly of rearing livestock, animals and their products constituting the "crops" of the nomads. Livestock is grazed on whatever grass or bush vegetation grows naturally in the areas occupied by a nomadic tribe, rather than being fed on crops raised for the purpose. This vegetation varies from area to area, as an inspection of appropriate maps reveals. Almost everywhere it is sparse, because the low rainfall permits only a patchy plant cover, with much bare soil showing. Trees exist only in narrow bands along some stream courses, but scattered scrubby bushes are common in many regions, and bunch grasses are characteristic. Grass greens only for a few weeks, at the times when the scant rains fall, and then dries into naturally-cured hay that remains suitable and available for feed for several months. Although the livestock feeds upon leaves and tender twigs of the bushes, as well as on the grass, the number of animals which the vegetation will support upon a given area is everywhere low. Livestock density nevertheless varies considerably from district to district, as well as from year to year, since the luxuriance of the vegetation depends chiefly on the amount and distribution of the rainfall, and there is considerable regional

variety in these respects. Another factor limiting the density of livestock is the supply of water for drinking. In some areas the amount available ordinarily gives out before the forage is all consumed, even though the yield from perennial springs and streams be supplemented by temporary ponds or pools which persist for some days or weeks after each rain in the beds of intermittent streams, and by such wells as can be dug down to water bearing strata.

independent of climate, natural vegetation, water supply, and native animals, since these natural conditions are not everywhere compulsive, but merely set limits within which the inhabitants may exercise choice. In nearly all the regions of nomadic herding sheep constitute a significant, and in many places the dominant, element in the livestock association. Sheep are admirably suited to living in these lands of scanty forage and restricted water supply, and they

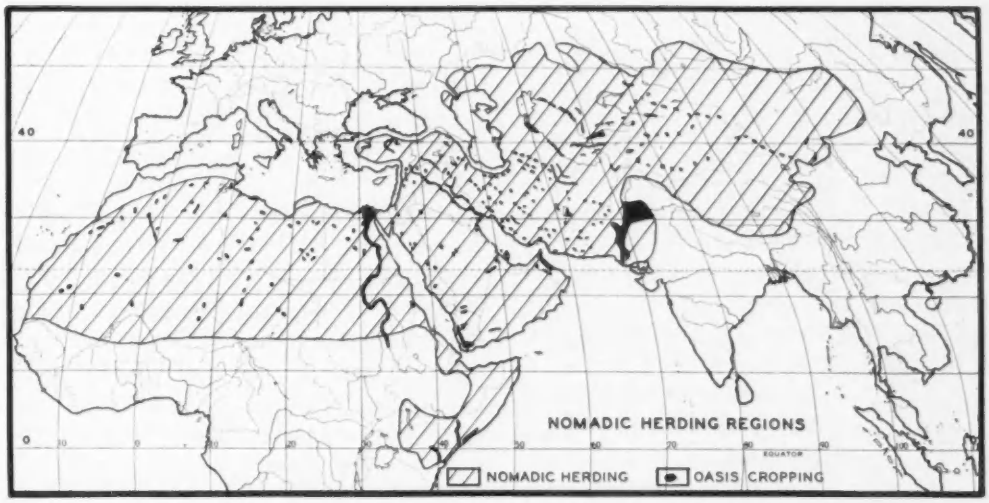


FIGURE 1.—Nomadic herding occupies the broad belt of dry lands that extends from the Atlantic Ocean almost to the Pacific. Scattered like islands through this vast territory are numerous oases of irrigation cropping. (After Sapper, Blanchard, Grenard, Machatschek, Stamp, and Jaeger. Boundaries are only approximate, because source maps disagree. Base map is Goode's equal area Homolosine.)

The kinds of animals reared by the nomads vary from region to region. Regional differences in kinds and amount of vegetation and in quantity of water undoubtedly are responsible for some variation in kinds of livestock. Climate also exerts direct physiological effects on living animals, and has thus played a rôle. The species of wild animals originally available for domestication in each region also were not the same. Finally, some of the variations probably have grown out of tribal customs

yield wool, milk, meat, and skins, all of which are very useful to their owners. Goats are reared along with sheep in many regions and supply much the same products. Cattle constitute an element in the livestock association of nearly all nomadic herding regions; in some regions they exceed sheep in importance. Besides meat and some milk, cattle yield hides and horns, and some of the animals commonly are employed as beasts of burden and even for riding. In the high and cold Plateau

of Tibet yaks take the place of cattle. Horses are common in most of the regions of nomadic herding. Except for riding they are not much used as beasts of burden, but mares are milked as a rule, and colt flesh is an especial delicacy, at least in Mongolia. The Arab horse, bred for speed, is one of several famous strains perfected by the nomads. It has been truly said that the nomad grows up with his horse, and considers him his choicest possession. Asses are minor but characteristic burden bearers in a number of regions, also supplying milk. In many but not all the lands of nomadic herding, camels are important members of the livestock association. In the Sahara two distinct breeds have been evolved: the mehara, a light-weight, rapid traveller, and the hamla, heavier in build and more effective as a pack animal. The camel is of peculiar value in the desert in that it outranks all other domestic animals in its ability to travel long distances without water. Two species of camels have quite distinct distributions. The darker, one-humped dromedary lives in the hotter regions, such as the Sahara, while the lighter-colored, thicker-haired, two-humped bactrian camel is restricted to regions with a true winter, such as Mongolia. Camels are milked, and from them is obtained a valuable hair which is woven into fabrics. Dogs are universal among the nomads, and besides serving as pets, assist in herding operations.

MIGRATION

Frequent movement from locality to locality is the essence of the nomad's life. Each day the flocks and herds must be grazed on a different tract from that on which they found nourishment the day before. Within a few weeks at most, therefore, forage is consumed on grazing grounds readily reached from a given encampment, which must then be moved to a new locality some miles away.

Seasonal migration is as characteristic of nomadic herding as is the moving of the encampment every few weeks to fresh grazing grounds. Seasonal migration results from the fact that the pasturage or the water supply or the weather in many regions is suitable for animals only during a particular season. Hence the itinerary of the short moves is planned so far as possible to keep the flocks and herds perennially in a region, among those available, that is having its most favorable season. For instance, as summer approaches, many tribes leave hot lowlands and ascend into mountain pastures accessible only at this season. Other tribes move into and out of deserts with the advent and waning of the rains. Some movements are planned to bring the tribe into contact, at the season when natural forage is scarcest, with sedentary crop raisers in oases or in humid areas; while the tribe is in these crop-growing areas livestock products are traded for vegetable foods and forage. The following examples of seasonal migration are typical. Khirghiz tribes spend the winter on piedmont plains at the base of the Altai, Tian Shan, Pamirs, or Kwen Lun, or in the lower valleys in these highlands, but move up to the high meadows of the upper valleys or the Summit plateaus for the summer months. Nomads of the Plateau of Iran (Persia, Afghanistan, and Baluchistan) spend the summer in the mountains, and the winter on the lower levels of the plateau or on the

Plains of the Indus to the east or the Plains of Mesopotamia to the west. In some cases seasonal migrations are northward in summer and southward in winter, as with Khirghiz tribes on the plains of Russian Turkestan. Along the northwestern border of the Sahara, tribes spend the winter in the desert, at which season it rains a little and the grass sprouts and drinking water is available. In the spring or early summer, as the temperature rises and aridity becomes intense, and pasturage and water scarce, the tribes leave the desert and move northward and upward into the Atlas Mountains. In the southern Sahara and the northern border of the Sudan, the nomads are in the Sahara during the season of highest sun and accompanying rain, after which period they move south into the Sudan. In Arabia the practice of seasonal migration is well illustrated by tribes that graze their flocks and herds in or on the borders of the Nefud Desert during the winter, which is the season of rains and of better pasturage, and in the summer move southward into the highlands of the interior of the plateau, or eastward into the less arid plains of Mesopotamia.

Although ownership of land in the Occidental sense is unknown in most regions of nomadic herding, the territory over which a given tribe wanders during the course of the year appears to be pretty definitely determined by custom and a sort of "gentlemen's agreement" between tribes or their chieftains. Occasional disputes over tribal domains apparently leave the stronger contender victorious, often by killing off the men and appropriating the women of the weaker group. At any moment during the year only a small portion of the territory under the jurisdiction of a tribe is actually in use for its encampment and grazing ground. Therefore a map of occupance as of a given day would show widely separated camps, each with its associated flocks and herds grazing within a radius of two or three miles, and absolutely empty space beyond. A few weeks later the picture would be the same in essence, but the encampments with their associated stock would occupy different localities.

The mountain meadows frequented in summer by many nomadic tribes have a much more luxuriant grass growth and consequently a higher carrying capacity than have the drier lowland grazing areas. Several tribes therefore may camp close together in one high valley, and may remain thus encamped for a considerably longer period than any one of the tribes would stay in any one encampment on the lowlands. This is particularly the case in the highlands of Central Asia, where these summer concentrations of nomads have given rise to the practice of traders visiting such groups of encampments to purchase wool, skins, and intestines, in return for such manufactured products as attract the fancy of the members of the tribes. In contrast to these rather luxuriant highland grazing grounds, extensive desert stretches in the Mongolian Plateau, the Tarim Basin, the Plains of Turan, the Plateau of Iran, the Arabian Plateau, and the Sahara are so nearly devoid of vegetation suitable for forage that they are visited only for short periods or not at all by the nomads. No attempt has been made on the map, Fig. 1, to delineate these unused or very slightly used areas.

Quality of Stock and Crops

Most of the animals reared by nomads are low-grade, for controlled breeding is all but unknown. Furthermore, the recurrent scarcity of forage or water or both is detrimental to the proper growth of the stock, especially the young animals. Some tribes make a point of breeding riding horses or riding camels of a grade that is high in comparison with the rest of their stock. These choicer animals are favored in times of shortage of forage or water, but even so their quality does not appear high to one acquainted with thoroughbred livestock in many regions of the Western World.

The frequent moves from camp to camp make crop raising by the nomads almost impossible. Nevertheless, many tribes do manage to produce some crops despite this handicap and the further disadvantage of low and uncertain rainfall in most sections of the regions over which they move. They scratch seeds of wheat or barley into a patch of unfenced and unplowed land, choosing a locality where experience has shown that at least in years of "good" rainfall such plantings will mature. They then arrange their itinerary so as to return to the locality at harvest time, hoping that wild animals or other tribes have not already reaped the grain. Yields from such plantings are low at best, and in many years nothing is obtained but a little straw that can be used for fodder.

Organization of Life

Nomadic life sets very definite limitations on the form of habitation and the kinds and quantity of worldly goods which the people possess. Their homes are tents made of felt from sheep wool, or of cloth woven from wool or goat or yak hair, or of skins. The line separating the use of felt from goat hair cloth as "building material" appears to coincide approximately with the line between regions possessing and those lacking a real winter. The black goat hair tent of the Saharan and Arabian nomads would afford ill shelter from the blizzards that occasionally rage in Mongolia and Turan, whereas the warm felt "yurt" of Central Asia admirably protects its makers.

Nearly all the simple equipment used in the nomad's camp, as well as clothing and riding gear, are made from materials obtained from the livestock. Leather water bags, woven wool carpets, woolen garments, rawhide ropes, and saddles are examples. All these, and the tents themselves, can readily be packed on the backs of animals and moved to a new camp site. As easily transported are rifles and a very few articles of hardware which, along with cotton cloth, must be obtained by trade. Food consists largely of livestock products. Cheese, clarified butter, clabbered and fermented milk, and meat are the staples. These are supplemented by a few items, such as grain and tea, purchased from oasis dwellers or brought in from outside regions. The fuel supply of wood from scrubby bushes is supplemented by dried dung.

Years of plenty, alternating with years of shortage or of actual famine, are the lot of the nomadic herder. A period of especially low rainfall results in one or more seasons of scanty pasturage and insufficient drinking water. Then severe losses of livestock follow. In some regions sleet storms in winter may veneer the vegetation with ice, and stock starves because it is unable to get at

the forage. These losses reduce the tribe's possessions, and when unusually heavy bring about food shortage and even famine. In times such as these nomadic tribes are prone to invade each other's grazing grounds, to descend upon neighboring oases, and even to make raids upon sedentary agriculturalists of humid lands which adjoin their own unreliable territories. Hardy by virtue of their exacting life, goaded to desperation by hunger, small bands of nomads have more than once invaded and conquered much larger groups of farming peoples, although in most instances the invaders have eventually been absorbed into the subjected but larger and more firmly intrenched group. The successive waves of "barbarians" that swept across Europe or descended upon the plains of India or of China, were, according to one theory, set in motion by a series of unusually dry periods in the heart of Asia. In these cases the exodus of nomadic herding peoples from their home lands sometimes persisted for decades. Similar climatic expulsions from the Sahara may have caused the nomads to drive the miscellaneous peoples of highland Guinea into the refuge areas they now occupy.

The nomadic herding type of land occupance and use appears to have been peculiarly favorable to (perhaps it has compelled) the tribal form of organization under the leadership of a chieftain. Each group of herders is widely separated from its nearest neighbors. Within the group individuals must act in concert in many daily affairs. The animals are herded together. The encampment must be moved as a unit. The whole tribe must be able to mobilize on the instant against an unexpected enemy. Many group decisions, such as where and when to move, determine prosperity or famine, and can best be made by a highly experienced and responsible individual. A tribe of nomads is in effect a well-disciplined and organized army under the command of its chieftain, ready at all times for the pursuits of peace or the waging of war.

Many nomadic peoples eke out their precarious existence by serving as caravan men. Accustomed to living in dry regions, and possessing the animals that must be used in the carrying trade across the deserts and semi-deserts of Mongolia, Turan, Persia, Arabia, and the Sahara, the nomads from time immemorial have been the transporters of commodities between the Orient and the Occident, and between Central Africa and the Mediterranean. With the discovery of sea routes about the margins of the "World Island" of Europe-Africa-Asia, and with the much later construction of railroads, such as the Trans-Siberian and many lines that tap the deserts all along their margins, the through caravan trade has greatly declined. An example is the once famed silk trade between China and Europe. Even today, however, the trade across some desert regions, and especially the branch-line traffic to railheads and to some sea- and river-ports, is carried by long lines of slow-moving camels.

SEMI-NOMADISM

"Semi-nomadism" is characteristic of a good many small areas within the extensive regions where nomadic herding dominates. In these small districts the tribes live in fixed villages of substantial houses during the winter, feeding their flocks and herds on pasturage in the vicinity, or on stored crops. As summer ap-

proaches part of the tribe moves up into mountain pastures with the livestock, there living the life of nomadic herders in frequently moved tent encampments. The residue left behind in the village plants, tends, and harvests crops, just as any group of sedentary farmers might do. With the coming of winter the nomadic group drives the flocks and herds back to the village and takes up settled life. Semi-nomadism is common in many of the mountains of Central Asia, Persia, and Anatolia. No attempt is made on the map, Figure 1, to delineate the areas of semi-nomadism.

OASIS CROPPING

Within the borders of nomadic herding regions are many small districts and a few good-sized areas where the people live in fixed habitations and engage in growing crops by irrigation, which radical differentiation in mode of life sets these areas apart from the lands of the nomads. The larger areas of irrigation cropping are shown on the map, Figure 1. The aggregate population of these densely packed oases is several times as great as the total population of nomads in their vastly more extensive territories. In Tibet, for example, where the oases are not shown on the map because of lack of data, it is estimated that fourteen-fifteenths of the three million inhabitants are sedentary crop growers in the valleys. In all the nomadic herding regions a limited trade has grown up between these two contrasted groups of people, to exchange the small surpluses of commodities each produces. In the western Sahara the oasis dwellers are definitely vassals of the nomads, but elsewhere the sedentary peoples appear to be independent of the nomads except for occasional periods of conquest.

BOUNDARIES OF NOMADIC HERDING REGIONS

Whatever may have been the case in the distant past, the areas occupied by nomadic herding in recent centuries have not changed greatly. On the plains of southeastern Russia, on the Siberian border of the Khirghiz Steppes, and on some of the piedmont plains of Turkestan, Russian farmers have taken over former grazing lands of the nomads, or the latter have themselves become sedentary crop growers. Chinese farmers have moved into the less dry borders of Eastern or Inner Mongolia, as well as into the fertile Plain of Manchuria. In the Plateau of Anatolia nomadism is less widespread than it was a few centuries ago. In Mesopotamia, in the Tarim Basin, and in other spots in the dry regions of both Asia and Africa, in contrast, irrigated crop lands have been abandoned and are utilized now, if at all, only by nomads with their flocks and herds. In general the tendency in recent centuries appears to have been for the total area devoted to nomadic herding to shrink somewhat, but not greatly.

As to the future, it seems probable that no extensive areas now occupied by nomads are likely to be taken over by crop growing peoples. The obvious reason for this prediction is that with the exception of a few small areas the nomadic herding lands are climatically unsuited to crop growing, chiefly because of low rainfall. The possibility of transforming the regions of nomadic herding into areas of commercial livestock ranching constitutes an interesting subject for speculation. In extensive regions

in North America, South America, South Africa, and Australia, with climates and natural vegetation similar to those in the regions of nomadic herding, livestock ranching has within the last century completely supplanted earlier and less productive forms of land utilization, chiefly hunting and collecting. It is an open question, however, whether or not the nomadic herding tribes of the dry lands of Asia and Africa can be similarly dispossessed. In the first place, their hold on the areas which they occupy is much stronger than was the case with most of the dispossessed peoples in the present regions of livestock ranching. Furthermore, there as yet is no evidence that the organization of life among the nomads can be so fundamentally altered as to permit the effective carrying on of commercial livestock ranching, or any modification thereof. Finally, most of the areas of nomadic herding are almost completely lacking in essential railroad outlets, and it is very doubtful whether it would pay to construct the lines without which livestock ranching could not exist. The probability seems to be that for a long time to come nomadic herding will continue to be the dominant type of agricultural land occupance in practically all of regions where it now exists.

BIBLIOGRAPHY

Of the numerous sources consulted in the preparation of this article, a few of the more valuable are cited below.

1. Karl Sapper: *Allgemeine Wirtschafts- und Verkehrsgeographie.* Second edition, Leipzig and Berlin, 1930.
2. Ellsworth Huntington: *The Pulse of Asia.* Boston and New York, 1907.
3. Fritz Machatschek: *Landeskunde von Russisch-Turkestan.* Stuttgart, 1921.
4. Raoul Blanchard: *Asie Occidentale* (Geographie Universelle, Tome VIII). Paris, 1929.
5. F. Grenard: *Haute Asie* (Geographie Universelle, Tome VIII).
6. E. F. Gautier: *Le Sahara.* Paris, 1928.
7. Andre Berthelot: *L'Afrique Saharienne et Soudanaise.* Paris, 1927.
8. Ernst Feige: *Die Haustierzonen der Alten Welt.* Petermann's Geographischen Mitteilungen, Erganzungheft No. 198. Gotha, 1928.
9. Fritz Jaeger: *Afrika.* Leipzig, 1928.
10. *Pioneer Settlement*, chapters by Voshchinin, Cressey, Lattimore, Ahnert, and Young. Special Publication No. 14 of the American Geographical Society.

SOUTH RANGE, KEWEENAW COPPER COUNTRY: A MINING PATTERN OF LAND OCCUPANCY[1]

Robert S. Platt

COPPER mining in the Keweenaw Peninsula has been discussed in voluminous works from the viewpoints of geology and mining engineering.[2] This article from a geographical viewpoint deals with the mining pattern of a normally developed part of the peninsula, a district that has been responsible for about 13 per cent of the copper output of the region (Fig. 1).

Features of the Pattern

The heart of the South Range is a string of mines on the east flank of a range of hills (Fig. 2), and in relation to these mines other features of the cultural landscape fit into their respective places (Fig. 3)—stamp mills ten miles to the northwest on the Lake Superior shore, smelter and docks five miles to the northeast on the Portage Lake shore, a railway connecting these focal establishments, villages clustered near them and power plants to serve them—all distributed in the background of hills and valleys and enclosed in a forest frame (Fig. 4).

A first glance does not reveal these features thus related: superficially the area appears to be dominated by the forest, broken here and there by

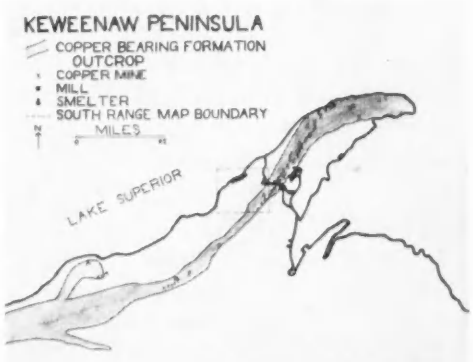


FIGURE 1.—Keweenaw Peninsula Copper Country. (Based on U. S. Geological Survey: Professional Paper 144, Plates 2 and 3; and Michigan Geological Survey: Geological Map of Michigan, 1916.)

clearings, a majority of the clearings partly cultivated and containing isolated houses, and only a few containing the mines and associated establishments which give character to the district and dominate the functional pattern of terrene occupancy. The essential features of the pattern represent a local solution of problems connected with obtaining copper—not the only possible solution but a successful one, as evidenced by the successful functioning of the pattern.

Features Related to Discovery

The most clearly fundamental features of the pattern, the mines them-

[1] This article is based on field work done in August, 1931, by a University of Chicago field class which included the following members: Albert L. Boley, Winifred E. Broderick, Lawrence C. Davis, Verna B. Flanders, N. Bouton Guyol, Ruby M. Harris, Rayburn W. Johnson, Mary Lawrence, Herman F. Otte, Virgil O. Petty, Mary J. Read, Geo. E. Schnur, Norah Zink.

Acknowledgments are due to the Copper Range Company, particularly to Mr. Albert Mendelsohn, General Superintendent, and other representatives at the mines and mills, and officials of the Copper Range Railroad, the Copper District Power Company and the Michigan Smelting Company, for their friendly coöperation.

[2] Examples of valuable work in these fields are: U. S. Geological Survey, Professional Paper 144, *The Copper Deposits of Michigan*, 1929; and U. S. Bureau of Mines, Dept. of Commerce, Bulletin 306, *Mining Methods and Practice in the Michigan Copper Mines*, 1929.

selves, represent the present stage in a solution of the problems of discovering and extracting ore. The mines are few and unevenly distributed; mining operations occupy but small and irregular spaces in the district. These facts reflect circumstances of ore distribution and discovery. Ore bodies are relatively few in number, small and irregular in extent, and unevenly distributed. The process of discovery has had no easy rules for success; discovering ore has been by finding it. Each of the four mines represents a separate, fortunate discovery.

FIGURE 2.—Land forms and streams in the South Range area. (Based in part on U. S. Geological Survey: Houghton Topographic Sheet, 1915; and U. S. Army Corps of Engineers: Lake Superior Coast Chart 4, 1926.)

Irregularity, then, is one aspect of mine distribution. But this is within a larger regularity in which definite and orderly arrangement is evident. All the South Range mines are inland from the Lake Superior shore on high land and have a northeast-southwest alignment (Fig. 2). All the ore discoveries have been within a well-defined belt three miles in width extending northeast and southwest—part of a longer belt reaching the full length of the Keweenaw Peninsula, in which many ore bodies have been discovered and many mines established (Fig. 1).

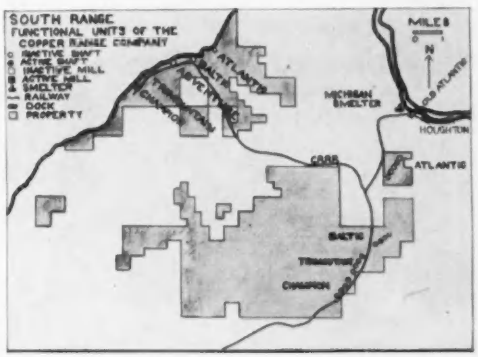


FIGURE 3.—Functional units of mining in the South Range area.

This belt is the backbone of the peninsula, formed by the outcrop of resistant rocks dipping steeply northwest (Fig. 5). In most places the rock does not outcrop literally at the surface but is covered with a mantle of glacial drift varying in depth from place to place. The copper bearing series is for the most part of rocks containing a mere trace of copper, basic igneous rocks formed by Pre-Cambrian lava flows on a horizontal surface and later tilted to their present position. These layers of basalt are massive and relatively impervious, with the exception of a few in which the upper part originally became porous as a result of gas bubbles and cracks made during rapid cooling of the lava flow surface, and with the

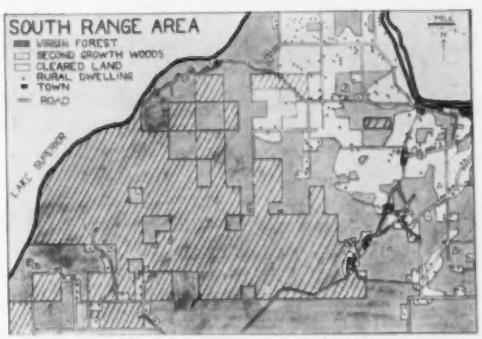


FIGURE 4.—Forest, clearings, roads, and houses in the South Range area. (Based in part on Houghton County Road Commissioners: Road Map, 1930.)

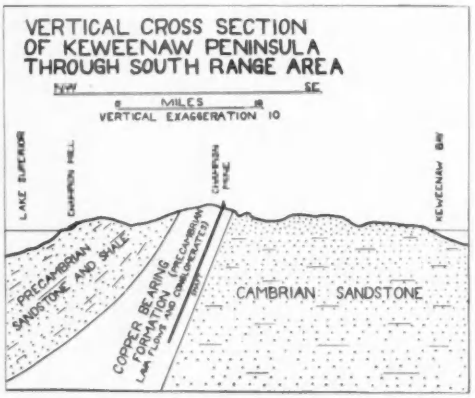


FIGURE 5.—Cross section of Keweenaw Peninsula showing surface configuration and underlying formations. (Based on U. S. Geological Survey: Professional Paper 144, Plate 3; and Houghton Topographic Sheet.)

exception also of a few interbedded strata of conglomerate and some subsequent fissures through the rocks.

The spaces in these thin pervious layers are now filled with mineral matter, apparently deposited by water rising from below after the rocks had been tilted to their present position. Most of the mineral deposit is worthless—but a small fraction of it is copper, almost pure copper, in fragments ranging in size from invisible specks to enormous masses, associated with various other minerals some deposited before copper and others after in a series of replacements, concentrated where the lode has been particularly pervious to great depths and practically absent elsewhere.

Thus it appears that the copper lies within a rock series limited by a persistent fault on the southeast and by overlying sedimentary rocks on the northwest; that within these rocks copper is practically confined to about 1 per cent of the thickness of the series in a few well-recognized lodes and associated fissures; that along these lodes copper has been found concentrated in a limited space within a much greater extent of unproductive lode rock, and that the significant concentrations form ore bodies averaging about 1 per cent copper.

These facts of orderly arrangement in the distribution of ore bodies condition not only the distribution and form of mines but also the development of systematic patterns of prospecting. Unfortunately the detailed irregularity of ore bodies has prevented a complete victory of system over chance.

FIGURE 6.—Champion Mine, Shaft Number 4, looking northeast to Shaft Number 3.

FIGURE 7.—Painesdale village houses and high school, looking east toward the mine land; Champion Mine Shaft Number 2 in right background. The row of similar frame houses built and owned by the mining company and the fine school supported by mine taxes are characteristic.

Progress of Discovery

Time is a factor in the present pattern of mining. In the South Range there are no ancient mines. The four mines of the district all are

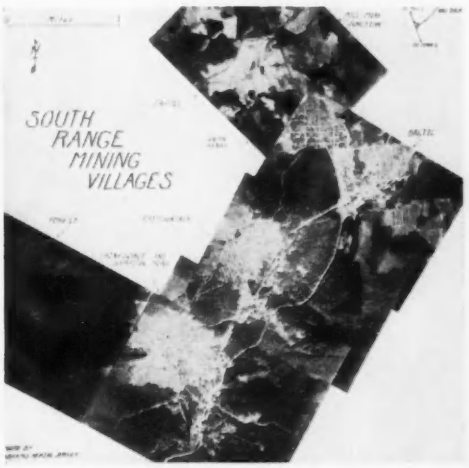


FIGURE 8.—Aerial view of the three more southerly mines and villages, the commercial village of South Range, and the central railway junction. (Courtesy of Abrams Aerial Survey, Lansing, Michigan.)

relatively modern—large and systematically laid out. The northernmost of the group is the least modern; for many years it has been inactive. The other three are more modern and are still active—two of them in the last stages of activity and the southernmost at the height of its career (Fig. 3).

and penetration took place from the north—a history associated with an absence of fissure deposits containing conspicuous masses of copper, with the presence of an uncommonly thick mantle of glacial drift increasing in depth toward the south, and with the proximity of the Portage Lake waterway cutting across the peninsula just north of the district (Fig. 1).

Fissures containing conspicuous masses of copper have been found mainly in districts far northeast and far southwest of the South Range at opposite ends of the peninsula, near the tip and near the base. In these other districts copper was mined in pre-historic times and the first historic mines were opened in the middle of the nineteenth century. Lode deposits in the rock beds, larger than the fissure but containing inconspicuously small fragments of copper, were discovered later at the place where Portage Lake cuts across the outcrop of copper-bearing rocks in the middle of the peninsula. From the Portage Lake shore discovery spread north-

FIGURE 9.—Virgin forest of mixed hardwoods and hemlock, one mile west of Painesdale (see Fig. 8).

FIGURE 10.—Farm in a forest clearing four miles west of Atlantic.

These facts reflect the progress of mining in the peninsula, which in turn reflects distributive circumstances of copper occurrence and discovery. Of the various districts in the Copper Country, the South Range was developed most recently eastward over a smooth upland with a shallow mantle of glacial drift to include the great deposits of the Calumet and Hecla Mines in a district practically coalescing with that at the tip of the peninsula. Then finally discovery spread from Portage Lake

FIGURE 11.—Aerial view of Portage Lake at Houghton, Atlantic Mine and village and farm lands. (Courtesy of Abrams Aerial Survey, Lansing, Mich.)

southwestward through the South Range, into the area of rougher land and deeper drift. There it has stopped, separated by many miles of deep drift from the old district at the base of the peninsula. Attempts have been made to push the frontier of the South Range farther southwest. Diamond drilling indications led to the sinking of a shaft in glacial drift beyond the southern margin of the district, reputed to be the deepest sand shaft in the world, abandoned after failure to find more than a small pocket of ore. Perhaps there are more ore bodies, but quite likely there never will be more mines than those of the past and present.

As already implied, there was a considerable time interval between the opening of the first mine in the South Range, the Atlantic, and the opening of the second, the Baltic Mine. But thereafter, the third and fourth, the Trimountain and Champion, were opened in quick succession. The distribution of the four mines indicates circumstances conditioning this development: the later mines close together in a line at a considerable distance from the first (Fig. 3). The Atlantic Lode is high in the copper-bearing series, outcropping in the northwestern part of the copper belt. The Baltic Lode is the lowest productive member of the copper series, near the great fault at the southeastern margin of the belt.

And from the Baltic Mine discoveries were made along the strike of the same lode in adjacent properties, where the Trimountain and Champion Mines were established.

FEATURES RELATED TO EXTRACTION

So much for the discovery of ore and establishment of mines as reflected in the South Range pattern. A second problem represented in the pattern is that of extracting ore from the ground. This involves a great array of specialized mechanical equipment systematically distributed below and above ground at each mine

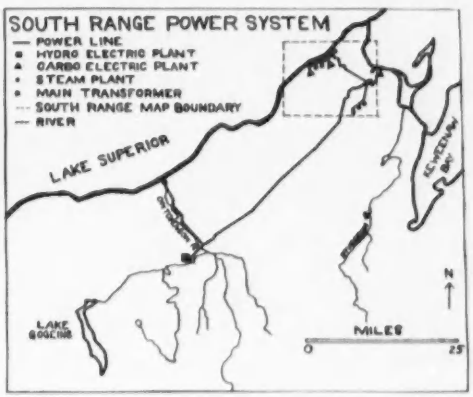


FIGURE 12.—South Range Power System.

(Fig. 6), men to operate the equipment, and power to drive it, timber to maintain underground openings, water for boilers, coolers, and human supply, buildings distributed above ground to shelter equipment and people and establishments to serve the people (Fig. 7), supply houses and the supplies themselves for constant replenishment of machines and persons, an intricate pattern of transportation lines to move various of these items to the area or within it—railways, roads, pipelines, and wires (Fig. 8).

The mines have been developed in an area previously almost uninhabited. All these things have had to be provided, most of them from outside the area. In spite of previous lack of development, the location of the district has made this relatively easy, for it touches the Great Lakes waterway at the port of Houghton on Portage Lake and the railway network of the United States at the same point (Fig. 3).

FIGURE 13.—Dam of Copper District Power Company looking north. Corner of reservoir in foreground, river channel at extreme right, penstock in middle distance leading toward power house which is one mile below and not visible from dam. Buildings visible in the background of the picture belong to an old mine.

Sources of Supplies

A few things have been obtained locally: timber, water, some food, and some power. Timber occupied all the land originally and the supply has been more than enough to timber the

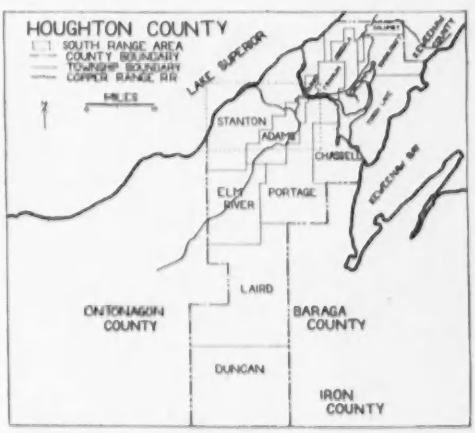


FIGURE 14.—Copper Range Railroad, and townships of Houghton County.

FIGURE 15.—Cars of ore at Baltic Mine Shaft Number 3, looking northeast toward Shaft Number 2.

mines and build the houses of the South Range. The present stand of virgin timber represents the existing surplus after years of cutting in more accessible tracts on property not reserved by mining companies for future supply (Fig. 4).

The forests on most of the land are of mixed hardwoods containing a large proportion of hemlock (Fig. 9), not yielding high-grade structural timber, but no less available for the short-lived requirements of mine props and miners' houses (Figs. 6 and 7).

The South Range is not a separate district in forest industry, but an undifferentiated part of a large region of commercial timber production, in which standing timber is cheap and transportation good. There has been no incentive for the mines to draw their supply exclusively from the immediate vicinity or from their own land-holdings, but rather to purchase from contractors either inside or outside of the Range area or from farmers clearing land.

Farming in the area is an adjunct of mining in more ways than one. The food contribution to the mine communities is of significance. Rough stony lands and short cool summers do not encourage farming, but the demands of the mine towns encourage the production of at least enough milk and potatoes to supply their needs. However, even this good local market probably would not be sufficient incentive were it not for the inducement for miners to begin farming in spare time on mine property and to become farmers on cheap land when laid off (Fig. 10).

FIGURE 17.—Champion Mill, Freda, looking northwest from top of mill over lower part of roof to Lake Superior. Flat beach of stamp sand below mill, crossed by water intake at left and tailings flume at right.

FIGURE 16.—The four shafts of the Baltic Mine, looking northeast toward Portage Lake. Waste rock piles below shaft houses, southeast part of village at extreme right.

The distribution of farms in the South Range area corresponds with these considerations (Fig. 4). The bulk of the clearings are in the northeastern part of the area on the smoother land and near the larger markets in the vicinity of Portage Lake, particularly around the northernmost of the South Range towns, which now, twenty years after the closing of the Atlantic Mine, has changed its character from a mining

FIGURE 18.—Smelter stack, looking northwest along Portage Lake waterway. Slag deposit in lower right-hand corner.

camp to a farm village, where the inhabitants eke out a living in small ways (Fig. 11).

The South Range is not a separate district in farming any more than in logging, but part of a larger region of sparse and struggling farms. In general, there is a regional movement of food supplies from south to north.

Another question of mine supply is raised by the water situation. The mines are on high land near the headwaters of streams (Fig. 2), and for many years a deficiency of water existed. Water for domestic supply was obtained from wells and that for mining purposes pumped from small streams dammed at lower places in their courses. Recently underground workers at the southwestern end of the Champion Mine (Fig. 22) broke into a drift-filled valley and tapped such a flow of ground water that it threatened to fill the mine until large pumps were installed. For this adversity partial compensation has been found in the incidental supply of water more than ample for both mining and domestic purposes, piped to the three active mines and the four villages near them.

Power and Transportation Layout

The South Range source of water supply is not a source of power but a consumer, and there is no potential waterpower site in the immediate vicinity. The need for power was easily supplied at the outset by means of coal obtained cheaply from Lake Erie ports as a return cargo in iron ore vessels. In view of the large amounts of power needed, a still cheaper source has been sought recently in the development of a hydroelectric plant outside of the mine area (Fig. 12). The narrow part of the peninsula affords no large watershed but at the base of the peninsula is the Ontonagon River, with a sharp fall in its west branch and a considerable flow partly regulated by Lake Gogebic. Here a plant has been constructed (Fig. 13), generating power

FIGURE 19.—Copper Range docks looking northwest. Loading copper ingots on lake vessel. Coal dock and Portage Lake in left background; flat cars with copper from smelter in left foreground.

FIGURE 20.—Portage Lake at Houghton, looking southwest. Copper Range docks at right on south side of waterway. South Range hills at right on skyline.

for the South Range and incidentally a surplus for nearby towns.

The high tension power line cuts through the forest and ramifies in the South Range as one element in the transportation pattern of the district. Other elements have been mentioned incidentally. The railway pattern is most fundamental. Not only have the mines depended on the railway, and the railway on the mines, but it is the railway that has given unity to the South Range as a district (Fig. 3). The line built originally to serve the Atlantic Mine has been superseded. Its successor, the Copper Range Railroad, started as a line to connect the Portage Lake towns and the far southwestern district of the Copper Country (Fig. 14). When the Baltic Mine was established a short branch line was built to it and a connection with the Lake Superior shore. Then the Baltic branch was continued to the Trimountain and Champion Mines and beyond to become the main line, superseding the original route which did not happen to be near the newly discovered ore bodies. The railway has maintained its line southwest of the district and added a line northeastward beyond Portage Lake, but these extremities are relatively unimportant appendages as compared with the section serving the mines within the South Range area, the essential part of the system.

Here the railway pattern is a fairly direct connection between three essential points—the mines, the Lake Superior Shore, and the Portage Lake shore—by way of a central junction, skirting the slope of the central range of hills and descending by moderate grades to the two shores (Figs. 2 and 3).

The function of the railway is to carry the product from the mines (Fig. 15) and supplies to the mines and associated establishments. Passenger trains have been almost discontinued in view of motor traffic over the short distances involved.

The road system is of minor importance in the mining enterprise (Fig. 4), the highway pattern supplementing that of the railway for carrying people and some of their supplies, and the byway pattern giving access to dispersed rural areas.

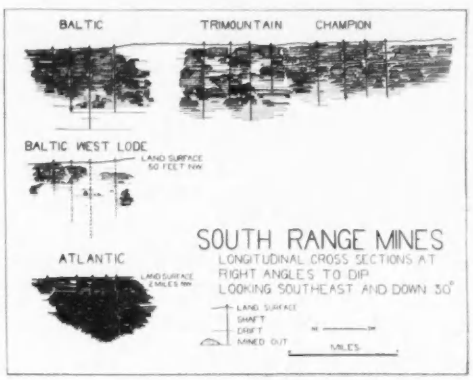


FIGURE 21.—Cross sections of the South Range mines. Distinctive details include: a break between the Baltic and Trimountain ore bodies; coalescence of the Trimountain and Champion, ore from the former mine now being hoisted in the latter; shallowness of the Baltic, and patchiness of the West Baltic reached by crosscuts from the shafts in the main lode; uniformity of the Atlantic, leanness of the Trimountain; southwest upper level water incursion in the Champion and present state of progress below.

The unity of the South Range district has been attributed to the railway system. This is not only a matter of traffic movement but of united control and organization. The Copper Range Company originating in connection with the Copper Range Railroad has acquired control of the four separately established mines, and all associated establishments and mine property, thus uniting the district under a single administration for copper production.

All the aforementioned features of

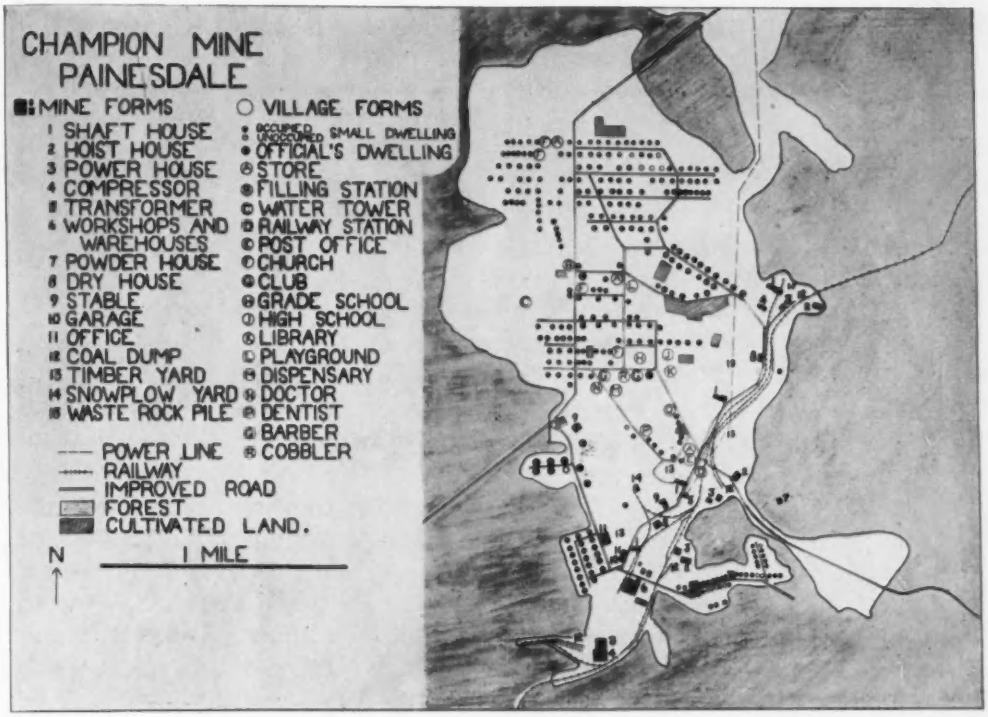


FIGURE 22.—Champion Mine and village of Painesdale.

the pattern—buildings, clearings and transportation lines—and the movements within the pattern, of power, timber, and other supplies, have a part to play in solving the problem of extracting ore from the ground. But obviously they function in connection with other problems also. One of these is the elimination of waste matter mixed with the copper.

FEATURES RELATED TO WASTE ELIMINATION

The pattern of establishments includes not only the mines with piles of waste rock (Fig. 16), but also stamp mills on the Lake Superior shore (Fig. 17), and a smelter on the Portage Lake shore (Fig. 18). The presence of these and their distribution represent a solution of the waste rock problem.

The material mined underground is about 1 per cent copper and 99 per cent waste matter. Some of the waste can be eliminated immediately by the miners themselves. Care in discarding low-grade material underground has increased until more than half of the mined rock is discarded, and now ore hoisted to the surface contains over 2 per cent copper.

Except for crushing this ore to convenient size and picking out by hand a few large pieces of mass copper, nothing more can be done to separate the 98 per cent waste from the copper without pulverizing and washing it down with water. Obviously it is worthwhile to discard the waste as near as is convenient, but in the milling process each ton of ore has needed about thirty tons of water. The former scarcity of water at the mines has been mentioned. Moreover, the disposal of twenty-

five tons of pulverized rock suspended in water for every ton of copper concentrate obtained is a problem in itself.

Mill Location

Some of the older mines in other districts had small mills on the banks of streams in the interior, but others have resorted to lake shore sites (Fig. 1). The Atlantic Mine first had its mill at the nearest point on Portage Lake, but the accumulation of discarded stamp sand began to

FIGURE 23.—Champion Mine Shaft Number 3. Shaft house at right, hoist and power house at left, coal dump in center.

encroach on the narrow steamship channel and a change was ordered by the government (Fig. 11). For a new mill the best alternative was the nearest point on the northwest shore of the peninsula (Fig. 3).

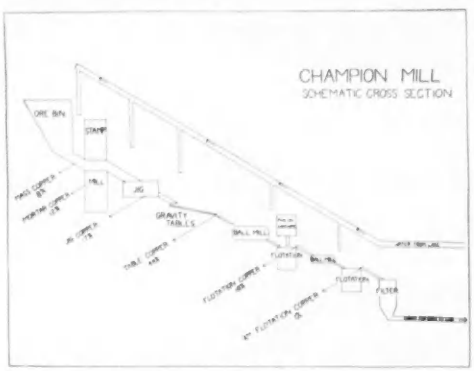
The example of the Atlantic was followed in succession by the other mines. One mine outside of the Range, the Adventure, in the district far to the southwest, also established its mill here, presumably attracted by the through connection already created by the Copper Range Railroad. The railway reaches the shore through a valley gap and thence extends southwestward to the newest and farthest mill (Figs. 2 and 3).

The mills have no harbor facilities and require none, in view of the ease

FIGURE 24.—Champion Mill and village of Freda.

of receiving their coal and other supplies and of shipping their product of copper concentrate by rail connection with the Portage Lake shore—traffic of small bulk in comparison with the trainloads of ore shipped from the mines to the mills. Fortunately, the mill site allows a downward haul for this heavy ore traffic.

The mills, like the mines, need not only rail connections and supplies,


CHAMPION MILL
SCHEMATIC CROSS SECTION
ORE BIN
STAMP
MILL
JIG
GRAVITY TABLES
BALL MILL
FLOTATION
FLOTATION
FLOTATION

in the ore and thus producing a concentrate which is more than half copper. The process of waste elimination has gone far enough to allow transportation of the residual product to any convenient point for the final purification. The final processes are distinct from milling and require ten times as much coal per ton of raw material. Formerly the South Range concentrates were shipped toward the coal fields and markets of the east for smelting. But in view of the cheapness of coal shipped westward on the lakes, the remaining 2 per cent of the refuse

FIGURE 26.—Champion Mill, Freda, looking southeast from Lake Superior shore across stamp sand deposit. Tailings flume discharging in right foreground.

from the ore, composing 40 per cent of the concentrate from the mill, is now eliminated in the district by the Copper Range organization.

The smelter is on Portage Lake at the nearest point west of the docks where there is space for the plant between the railway and the shore, and space for depositing the waste material without interfering with navigation (Figs. 3, 11, and 18). Slag from the smelter is much less in amount than the stamp sand from the mill and is not washed out in the water to spread and settle widely.

The smelter has its own group of buildings and machines and its own requirements for power, labor, and

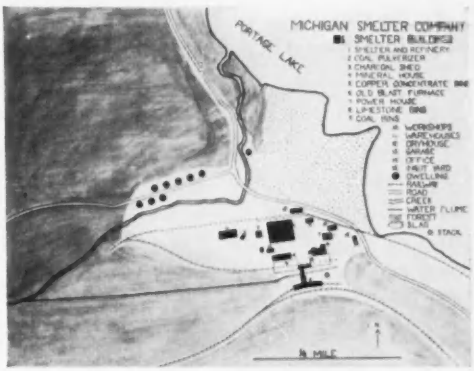


FIGURE 27.—Michigan Smelter.

supplies, provided in the same way as for the mines and mills. In addition to coal, limestone also is brought from outside the district. Green timbers are obtained from nearby tracts of second growth forest, and charcoal is provided by wood from the same source, burned in ovens within the wooded area above the smelter. These needs are small, as is also the need for water, adequately supplied by a brook, descending from the upland back of the plant. No separate village is needed at the smelter because of its proximity to Houghton.

The establishment is a refinery as well as a smelter. The smelting process eliminates all but a tiny fraction of the waste matter and

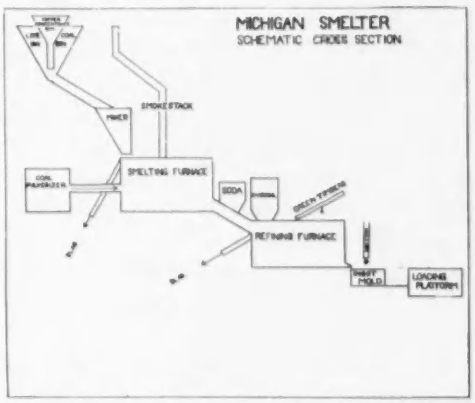


FIGURE 28.—Cross section of Michigan Smelter.

there is no need of further purification in order to avoid transportation of refuse. But the refining process is advantageously carried on under the same roof as smelting in order to handle the molten metal without interruption. It is a simple addition and provides the Copper Range Company with the completed mar-

FIGURE 29.—Michigan Smelter looking south from Portage Lake shore across slag deposit.

ketable product of the mining enterprise.

FEATURES RELATED TO SHIPMENT

Shipping the copper to market is the only remaining problem represented in the South Range pattern. The Copper Range dock is the main feature involved in the solution (Fig. 19).

The dock is on the south side of Portage Lake near the west end of Houghton (Figs. 3 and 11). This is the place at which the Copper Range Railroad coming in from the southwest reaches the waterfront at the principal port and commercial center of the Keweenaw Peninsula. The port is located where the sheltered navigable Portage Lake waterway crosses the copper-bearing lodes, and is the nearest shipping point for the South Range (Fig. 20).

In addition to the copper and coal docks, the railway shops are also here, located not with reference to copper shipment but primarily with reference to the main urban center and source of labor and supplies, the original focus of the railway system (Fig. 31).

DETAILS OF PATTERN FEATURES

The foregoing discussion indicates the general pattern of the South Range as an areal functional unit, developed in accord with the circumstances of the district. Further investigation indicates that the pattern has distributive individuality befitting its natural setting not only in general but also in the particular details of every feature.

In general, the mines are narrow slits cut into the earth along ore bodies extending downward toward the northwest (Fig. 5). In detail the cutting of these slits has such distributive complexity that every cor-

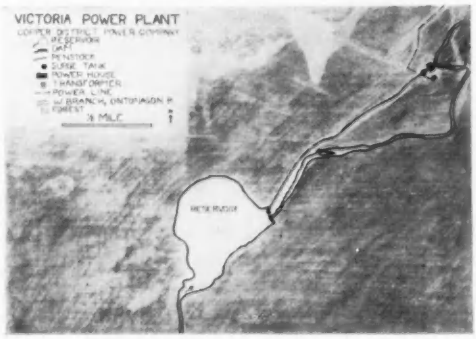


FIGURE 30.—Hydro-electric power site of the Copper District Power Company.

ner represents the solution of a local problem and has its own place and form in the pattern (Fig. 21). Each shaft assumes the dip of the adjacent part of the lode. Each level drift follows the ore body. Each stope takes form by selective excavation.

The texture of the pattern is made by advance and shrinkage stopes above, by retreat and filled stopes at

greater depths under excessive timber strains and rock bursts.

The spacing of shafts reflects the efficiency of underground movement (Figs. 16 and 21). Each shaft is a focus for the distribution of features below ground and above (Fig. 22).

Each building has its form and place: the shaft house itself with sloping northwest side and bulging southeast side (Fig. 16); the nearby hoist and power house, coal dump and rock pile on lower land (Figs. 22 and 23); the dry house and timber pile on higher land (Figs. 6 and 22); the more distant village on a selected site with clusters of community establishments (Figs. 7 and 22): the school, the church, the homes of officials; the separate commercial village of South Range with its stores (Fig. 8).

Even bare enumeration of details indicates their significance in the general pattern, as parts fitting together in their respective places to form the focal establishments of the district.

Apart from the mines, the stamp mill on its sloping shore (Figs. 24, 25, and 26), separating copper by a process minutely adjusted to local circumstances and character of ore; the other mills abandoned under unified organization (Fig. 3), but all their villages persisting, the largest at the north, the smallest at the south; the smelter also on a slope applying different processes under different circumstances (Figs. 27, 28, and 29); the power plant on its river (Fig. 30), with dam and reservoir (Fig. 13), mile-long penstock, surge tank, and power house; the docks at Houghton (Fig. 31), shipping copper (Fig. 19).

Much more might be added concerning the pattern, not only in detail, but also in general: on economic

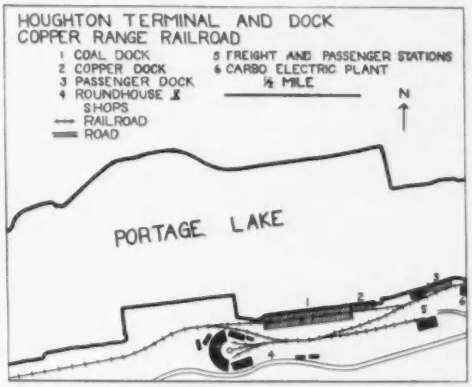


FIGURE 31.—Copper Range docks and shops.

aspects, production costs and quantities; on form and distribution of land holdings (Fig. 3) and subsurface rights; on form and distribution of political units (Fig. 14): Houghton County of the central Copper Country, Adams Township of the South Range mines and Stanton Township of the mills; on social aspects of unified organization by non-resident control; on kind and number of people; on the impending termination of the function and accompanying disintegration of the pattern—topics all postponed indefinitely and probably forever.

ECONOMIC ASPECTS OF THE DANUBIAN PLAN

Joseph S. Roucek

THE economic misery of Europe, which has been especially evident in Central and Southeastern Europe since 1929, has been for several years a subject of discussion for statesmen and economists. Following the example of the United States, the European states believe that they can improve their economic situation by strengthening the protectionist tariff systems.

Recently the financial peril threatening the Danubian states again became of prime interest following the announcement of the French memorandum of March 2, 1932, proposing an economic group of the Danubian states. This French scheme, known as the Tardieu or Danubian plan, stresses the primary need of correcting the underlying economic situation of Czechoslovakia, Roumania, and Yugoslavia, as well as Austria and Hungary, on the assumption that the improvement of their economic depression is fundamental to and independent of the effects of the world-wide depression and must be met before any measures to tide over the crisis can be successful. These five states are invited to form an economic unit, granting preferential tariff rates to each other, though the plan of a federation or even a customs union is excluded.

The reactions of the European and even of the overseas governments and of the press show the importance of the proposal, though nothing appreciably successful has thus far been achieved. Throughout the negotiations it was evident that the states concerned, the small as well as the big ones, cannot fully and completely isolate the political questions from the economic problems; in fact the political considerations seem always to loom as primary while the economic possibilities have been subordinated to a secondary position.

The failure of the preliminary discussion seems to show that the present period does not lend itself favorably for the realization of any such plan. The world emphasizes more and more the extreme protectionist policy, quite contrary to the recommendations of the world economic conference of 1927. Such policy is easily understood from the viewpoints of the individual states, but absolutely incomprehensible from that of the world's economic crisis.

If the economic structure of these Danubian countries, that is, of Czechoslovakia, Austria, Roumania, and Yugoslavia, is analyzed, it is seen that all these states are lands of medium-sized territories, none being strong enough politically or economically to dominate the others. In many respects these states are similar to each other, especially as regards the stage of economic and cultural development, and are connected by strong historical, cultural, and economic ties. Three of these states —Czechoslovakia, Austria, and Hungary—do not have access to the sea; hence their geographical position preordains them to be largely dependent in their commercial relations on the rest of Central Europe. Conse-

FIGURE 1.—A characteristic vista of Czechoslovakian land utilization, showing the distribution of forest, pasture, and crop land on the borders of the Moravian Basin. Varied land resources, abundant mineral wealth, excellent vicinal location, and adequate transportation facilities combine to make Czechoslovakia an almost self-contained nation. (Courtesy of J. Freund, Czechoslovakian State Railways, Prague.)

quently, the peace treaties provided for preferential duties among them, but permission has not been utilized.

There is another important point connected with this problem of the Danubian union, which is especially evident if the replies of the European Governments to the proposal are considered. The definition of Central Europe does not seem to be only one. The Germans especially emphasize in one of the points that an economic unit of the Danubian states should logically include Germany. Herein the German Government is renewing the conception and thesis that the states comprising the territory of old Austria-Hungary are within the German economic sphere. This idea is intimately connected with Pan-Germanism, supported and propounded in Germany by Lagarde, Treitschke, Houston Stewart Chamberlain, Rohrbach, Rüdiger, etc. It is especially objected to by the Czechoslovaks, who opposed it very skillfully in their war propaganda, notably in the London *New Europe*. The practical result is that some Austrian as well as German leaders emphasize that Austria cannot participate in any agreement which might be directed against the interests of Germany, or that no agreement is possible without Germany being included. Central Europe is still the possible intermediator in the economic expansion of Germany towards the Balkans as well as a strong market for German products. Even before the end of the past century, the German exports into Austria-Hungary were increasing more rapidly than the imports from that region, as is seen from the following table:[1]

	Exports from Austria-Hungary (In Millions of Marks)	*Exports from Germany to Austria-Hungary (In Millions of Marks)*
1898	672	452
1904	703	592
1909	750	770
1913	830	1,100

[1] J. Hanč, "O Středoevropské Hospodářské Dorozumění," in *Zahraniční Politika*, Vol. XI, No. 2, Feb. 1932, p. 109.

Thus in 1913 Austria-Hungary was the most important single buyer from Germany, as the Empire of Francis Joseph II bought 40.5 per cent of the total German exports and was also its main importer, covering 39.5 per cent of German imports. If the problem is approached from the standpoint of German foreign trade, Austria-Hungary took the second place in German imports with 7.7 per cent, and fourth place in German exports with 10.9 per cent. But immediately after the war the figures were reduced; in 1920 the respective percentage from the Succession States in imports was only 3.8 per cent and the German exports into these countries only 8.3 per cent. Afterwards the proportion improved. Between 1923 and 1928 the average imports of Germany reached 8.33 per cent and the exports rose to 11.8 per cent. These figures certainly determine the attitude of Germany on any regional plans of Central Europe.

If the German trade from the viewpoint of individual states of the Danubian region is evaluated, the following picture is obtained: During 1926 to 1929 Austria imported from Germany on the average about 17.5 per cent of the value of its total imports;[2] Czechoslovakia, 23 per cent; Roumania, 22 per cent; Hungary, 18 per cent; and Yugoslavia, 13.5 per cent. The exports into Germany during the same years were averaging for Austria, 14.5 per cent; Czechoslovakia, 20 per cent; Roumania, 20 per cent; Hungary, 11 per cent; and Yugoslavia, 10 per cent. It should be noted that the German imports into Austria are steadily increasing (1926, 15.8 per cent; 1927, 17 per cent; 1928, 19.9 per cent; 1929, 20.9 per cent; 1931, 22.5 per cent); on the other hand, the exports of Austria into Germany fluctuate, though remaining on the same average, that is, from 16 to 18 per cent. Similarly the exports from Germany to Czechoslovakia are largely increasing (1929, 25 per cent, and 28 per cent in 1921), while the Czechoslovak exports are decreasing (19.4 per cent in 1929 and 15.5 per cent in 1931). The same applies, regarding the increasing value of German exports, to Yugoslavia, while the Yugoslav exports fluctuate.

FIGURE 2.—The Elbe continues one of the important transportation arteries of both Czechoslovakia and Germany. The long, capacious canal boats carry a great proportion of the freight accessible to the waterways of the two countries. (Courtesy of J. Freund, Czechoslovak State Railways.)

All this demonstrates that German interest in the Danubian region is not at all small, and that this country will aim not only to keep these markets open for her products, but also increase them. But from the viewpoint of the Danubian states, the participation of Germany in this kind of economic union is not desir-

[2] The figures are based on U. S. Department of Commerce, *Commerce Yearbook 1930*, Vol. II, pp. 44, 175, 253, 291, 483, 612.

able, as the economic domination of Germany is too overwhelming. Thus it must be noticed that if Austria fears the strength of Czechoslovakia, it would be even more afraid of the domination of Germany. This is one of the strongest points used by the opponents against the abandoned proposal of the German-Austrian Customs Union. The German exports to Austria are larger than those from Czechoslovakia (19.9 per cent in 1926 from Czechoslovakia and 15.8 per cent from Germany in 1926; but 18.1 per cent from Czechoslovakia in 1929 and 20.9 per cent from Germany).

The above percentage table of the mutual trade of the Danubian States and Germany shows that there exists a special economic Central European region of great importance. For the sake of comparison we also include the participation of two states, most important from the economic viewpoint for this economic sphere—Germany and Italy:[3]

An analysis of the table leads to several important conclusions. The Danubian States and Germany are an interdependent region because the exports from each of the states into the other four states are larger than exports into any other state outside the region, with which the respective country has the maximum foreign trade. With the exception of Czechoslovakia the same rule applies to imports. From no other land—outside this region—do these states import more goods than from the Danubian region and Germany.

Czechoslovakia exports about one-third of her foreign trade to Central Europe, excluding Germany (textiles,

	1925	*1926*	*1927*	*1928*	*1929*	*1930*
Czechoslovakia (in Percentage)						
Exports	%	%	%	%	%	%
Central Europe	33.38	33.30	32.30	30.00	30.80	31.90
Germany	22.53	19.90	24.10	22.20	19.40	20.40
Imports						
Central Europe	18.80	21.12	19.50	17.10	16.70	20.00
Germany	31.30	21.20	20.90	24.80	25.00	38.30
Austria (in Percentage)						
Exports						
Central Europe	34.30	37.60	35.40	34.50	26.96	31.20
Germany	15.20	11.70	18.40	18.30	14.97	17.50
Imports						
Central Europe	38.90	43.80	39.30	35.40	31.51	38.10
Germany	15.80	15.80	16.90	19.90	17.45	21.10
Yugoslavia (in Percentage)						
Exports						
Central Europe	46.70	47.34	42.12	36.90	30.00	36.01
Italy	25.26	25.07	24.84	26.06	24.58	28.31
Germany	7.15	9.27	10.60	12.10	18.53	11.66
Imports						
Central Europe	44.68	47.73	47.42	43.71	43.78	43.45
Italy	18.78	132.82	12.90	11.99	10.85	11.25
Germany	9.90	12.63	12.34	15.69	15.64	17.55
Roumania (in Percentage)						
Exports						
Central Europe	38.36	.....	28.10	.....	.....	25.28
Germany	8.15	20.70	18.60	27.20	29.00	18.80
Imports						
Central Europe	35.00	.....	31.50	.....	.....	30.54
Germany	16.70	.....	22.70	.....	.....	25.07
Hungary (in Percentage)						
Exports						
Central Europe	69.40	66.20	64.10	63.72	57.19	54.34
Germany	9.90	12.90	13.30	11.66	11.67	10.21
Imports						
Central Europe	58.90	54.90	53.70	51.74	48.78	48.59
Germany	15.00	16.60	17.80	19.45	19.98	20.98

[3] Quoted by J. Hanč, *op. cit.*, pp. 110–111, who also quotes A. Lelka, *La Collaboration Économique des Nations de l'Europe Centrale* (Paris, 1931).

coal, wood, machinery, glass, leather, and paper), and imports about one-fifth of its total imports from that region. Czechoslovakia purchases more of its imports from Germany than from any other country and Germany is also the leading market for its exports. Austria ranks second in shipments of merchandise to Czechoslovakia; in addition, Austria still retains second place as a market for Czechoslovakia's exports.

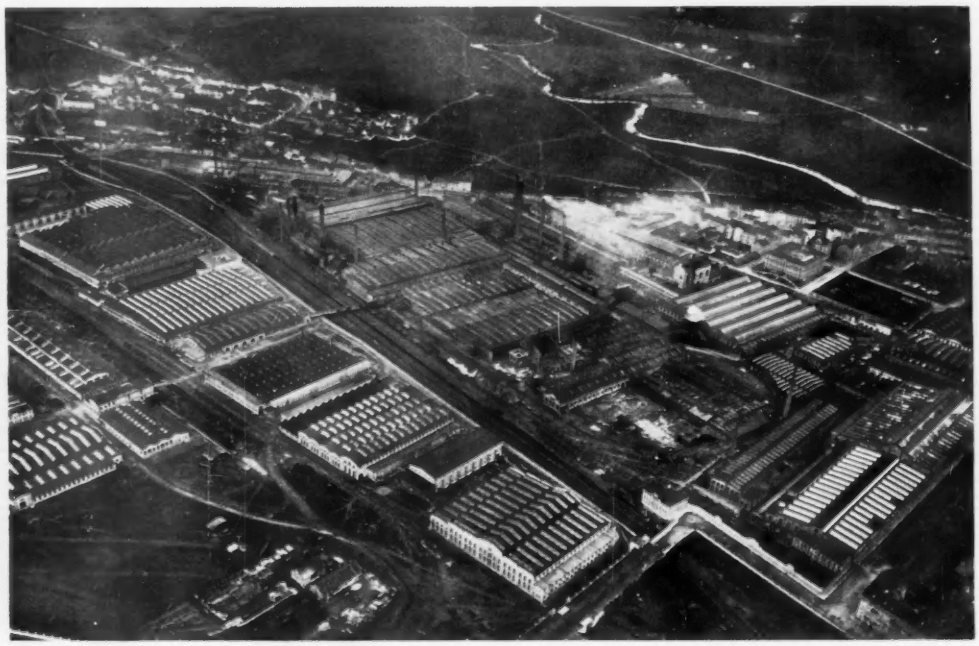


FIGURE 3.—The famous Skoda Works of Plzen (Pilsen), Czechoslovakia, one of the largest manufacturing centers of Europe, in which French capital is heavily invested. (Courtesy of A. Broz, Czechoslovak Legation.)

It is important, however, that, as regards the destination of Czechoslovakia's export trade, there is a noticeably gradual decrease of exports to the neighboring countries, that is, the Danubian region, and an increase of exports to more distant countries, particularly overseas. The main causes for this decline are the growth of tariffs and the gradual, though most by artificial, industrialization of all the Danubian countries, especially of Hungary. Thus the *New York Times* of April 30, 1932, reported large dismissals from the internationally known shoe factories of T. Báťa, whose phenomenal success has been based on foreign trade, due to the "prohibitive tariffs and import restrictions," . . . which "have closed practically all foreign markets while it is not yet possible to produce goods at available price of the quality required by possible customers in new markets." But the future prosperity of Czechoslovakia will depend largely on its regaining the old markets or finding new ones, as the whole economic structure of this country does not permit it to strive for or achieve absolute self-sufficiency.

Austria, similarly, sends into the Danubian region more than one-third of its total exports, Czechoslovakia taking second place after Germany for exports as well as imports. Nearly

two-fifths of Austrian imports come from Central Europe. Trade with Germany occupies first place in the commercial relations of Austria, the balance being, however, markedly passive for Austria, despite the effort made by both countries during the course of last year to achieve an improvement. Thus after the failure of the idea of a tariff union between Germany and Austria, the protagonists of the plan stress the impossibility of arriving at any economic grouping in Central Europe which would not include Germany. From the other agricultural states of the Danubian region Austria is most interested in Hungary, from which agricultural products and live cattle for exchange of finished products are imported. Vienna still remains the chief intermediary of trade of Central Europe, despite all efforts of the neighboring states to the contrary. The post-war favorable development of Austria's agricultural production should also be considered. The production of milk and of dairy products is not only adequate for home consumption, but also allows a surplus for export. The rearing of livestock is increasing, and the same applies to beet growing and sugar production, brown-coal output and electrification. Of course, Austria will depend even in the future on imports of agrarian products and coal, but the large percentage of trade of Austria leads us to conclude that the prosperity of Austria and its buying capacity depends on favorable and open trade relations with Central Europe. Improvement in the present economic crisis of Austria will react most favorably on the economic situation of other Danubian states. The same applies, to a somewhat lesser degree, to the case of Hungary, as will be presently seen.

FIGURE 4.—Where rail and water routes meet at Constanta, Roumania's most important port on the Black Sea.

Hungary places about two-thirds of its exports (flour, cereals, cattle, swine, poultry, lard, and wine) in Central Europe and buys about half its imports there. In 1929 Czecho-

slovakia supplied 22.1 per cent of the total value of imports, followed by Germany with 19.7 per cent, and Austria with 13.4 per cent. Austria was the principal market for Hungary's exports, taking 31 per cent of the total as against 34 per cent in 1928; Czechoslovakia bought 16.2 per cent, and Germany 11.5 per cent.[4] Roumania participated in the Hungarian exports to the extent of 4.5 per cent, and 7.9 per cent in imports. Czechoslovakia has to compete in Hungary with the Roumanian products as well as those of Yugoslavia. The governmental industrialization policy of Hungary has not been good. The fate of Hungary, like that of Austria, cannot be a matter of indifference to the Danubian states.

Yugoslavia provides Central Europe with two-fifths of its exports and two-fifths of its imports are provided by these countries. In the post-war years, Yugoslavia placed over two-thirds of its wheat, nearly all its exports of swine, half its exports of cattle, and over three-fifths of its fresh meat in Central Europe. The principal countries to which products of Yugoslavia are shipped and their percentages in 1930 are, in order of their importance, Italy, 28.31; Austria, 17.68; Germany, 11.66; Czechoslovakia, 8.20; and Hungary, 7.18. The principal products shipped to Italy are lumber, grain, livestock, meat, and meat products; to Czechoslovakia, grain, industrial and medicinal plants, livestock, and milling products; to Austria, grain, livestock, meat, and meat products; and to Hungary, grain, lumber, hemp, flax, and other similar products, ores, and cinders. The principal countries from which imports come are, with the percentage of their participation in 1930: Czechoslovakia, 17.60; Austria, 17.55; Germany, 16.82; Italy, 11.25; and Hungary, 5.83. The leading imports from Italy, Germany, Austria, and Czechoslovakia are cotton goods, woolens, rice, flax, and hemp, and manufactures of iron. From Hungary come wheat, flour, cotton goods, and manufactures of iron. Roumania sends to Yugoslavia only 3.20 per cent of the total Yugoslav imports, consisting mainly of salt and petroleum.

FIGURE 5.—Roumanian peasants, the bulwark of nationalism in Roumania as in all Danubian and most central European countries, returning to their crofts and villages from their scattered fields. Their heavily laden wagons bear fodder for stall feeding of cattle. (Courtesy of I. Rosenthal, Roumanian Legation.)

The economic relations of Roumania have some special characteristics. Before the War two-thirds of the goods imported came from Germany and from the former Austro-Hungarian Empire. In 1927 the percentage of Roumanian imports were: from Germany, 22.29; Austria, 13.30; Czechoslovakia, 14.24; Hungary, 3.73; Italy, 8.73; and Germany, 14.67.[5] Though Roumania can only export its agricultural products to Austria and Czechoslovakia and wood

[4] *Commerce Yearbook 1930*, p. 288.

[5] Institut de Statistique Générale de l'État, *Annuaire Statistique de la Roumanie 1929* (București, 1931), pp. 336 ff.

to Hungary, she gets two-fifths of the exports and one-third of the imports of Central Europe. The imports consist of industrial products from Austria and Czechoslovakia.

The above discussion proves sufficiently the relationship of the Danubian states within themselves, with Germany, and somewhat with Italy. Geography and history support it with their facts. The course of the Danube River preordains closer coöperation, though to a limited degree.

and the diminished demand for industrial products, it is clear that any further industrialization of these states must proceed very slowly and only after the buying power of the population and its standard of living have been raised. Already the signs of industrial overproduction and the lack of markets are discernible in Czechoslovakia and Austria. There is certainly an overproduction of agricultural produce; but the hardship of such surplus is less than that of industrial overexpansion.

FIGURE 6.—The Racita Iron Works, one of the most important metallurgical plants in Roumania. (Courtesy of I. Rosenthal, Roumanian Legation.)

Looking at the problem as a whole, it is found that the character of the Danubian states is predominantly agricultural. Roumania, Hungary, and Yugoslavia base their wealth almost entirely on agriculture; and agriculture is of great importance in Czechoslovakia and Austria. This fact promises outstanding developments for the future. Because of the great importance of the agricultural production for the Danubian states

From the viewpoint of agricultural production, the Danubian states can consider themselves, on the whole, self-sufficient. Czechoslovakia and Austria have to import wheat and grain from the other Danubian states (as well as from overseas); but the biggest producer of cereals is Roumania, followed by Hungary and Yugoslavia, all providing large surpluses. The same situation applies to cattle.

Thus the agricultural character of the Danubian states will also lead to the support of agricultural production by the intensification and rationalization of farming methods.

Industrially, the countries of Central Europe are less developed. The whole region stands far behind the German development. The most industrial countries are Czechoslovakia and Austria, the former taking over about 56.8 per cent of industrial undertakings of Austria-Hungary, the latter about 37.6 per cent. Yugoslavia and Roumania are rich in deposits of raw materials, while Hungary more or less lacks them. But the artificial and too rapid development of the industries of Yugoslavia and Roumania is resulting in hardship today. The number of factories has increased since the war by about 50 per cent, while the standard of living has not been much higher. From the economic viewpoint any future industrialization must be supported only if it will provide a healthy basis for economic production and raise the standard of living of the population. Most of the industries of these countries are existing only because of high tariff barriers.

In any future consideration of a Danubian union, the objections raised within the states themselves by the agriculturists against such plans must not be forgotten. This applies especially to Czechoslovakia, where the leaders of the peasants do not want to sacrifice within the framework of the suggested coöperation either the present level of Czechoslovak agriculture or the material situation of the Czechoslovak farmers. Thus the economic considerations again become interconnected with the political ones; but even more than that—the internal considerations of the Danubian states would prevent any effective realization of the plan. In addition to this, the recent discussions in London proved the inability of the Great Powers to come to an understanding in this respect.

This, therefore, leads us to the following conclusions: Economically there is an interconnected Danubian region. But Germany as well as Italy have their immediate economic relations with this region, and will therefore refuse to abandon their interests in this sphere. The internal politics of each of the states of the region will have to be taken into consideration. Today all evidence is negative, supported especially by the inability of the Great Powers to take initial steps in the matter. In other words, economics are subordinated to politics as far as the Danubian proposal is concerned. Hence the proposal is dead and will not be resurrected for some time to come.

THE NORTH KANSAS CITY URBAN DISTRICT[1]

John Q. Adams

THE North Kansas City Industrial District is a distinct physical, industrial, and political unit occupying a small bottom in a meander of the Missouri River immediately north of and adjacent to Kansas City, Missouri. Physically this area is separated from Greater Kansas City by the Missouri River; politically it is independent; industrially it has a distinctive development. The interrelations of its physical, political, and industrial conditions have unified the district. Thus unified, it offers an opportunity for interpreting (1) the morphology of the landscape, and (2) the localization of the identifying forms, in a unique industrial area.

The purposes of this study are (1) to identify and classify the various physical and cultural landscape forms which are found within the district and to show their interrelationships, (2) to interpret the structure of the cultural landscape by an analysis of the grouping and distribution of these forms, (3) to account for the localization of the various forms and structural features, and (4) to predict, on the basis of these data, the probable future changes in the landscape.

[1] The data presented in this paper were obtained by means of field studies, personal interviews, and library investigations made chiefly during 1928 and 1929. As a result of the general economic depression which began late in 1929 conditions in the district have changed very little since that time. For help given in gathering and organizing the data the author is especially indebted to Dr. Sam T. Bratton, Professor of Geography at the University of Missouri; Mr. A. W. Zimmer of the North Kansas City Development Company; Mr. Howard C. Smiley, Research Specialist, Kansas City, Missouri; and Mr. N. M. Fitch, Engineer, North Kansas City.

Genesis of Urban Forms

In spite of its location within a few miles of the center of Kansas City, Missouri (Fig. 1), the North Kansas City District remained distinctly rural until recent years. In fact, the invasion of this district by the city has been so recent that in 1929 only one-third of the land was occupied by urban forms (Table 1). The exclusion of the North Kansas City District from the urban growth of its great neighbor to the south was due to one outstanding condition; namely, the barrier effect of the Missouri River. A secondary factor was the danger of flood. The present urban development in the district has been made possible by piercing the river barrier and overcoming the flood menace.

The first breach in the river barrier was made by the old Hannibal Bridge, which was officially opened July 3, 1869. This structure served as Kansas City's railway gateway to the north. The rural aspect of Clay County Bottom, as the North Kansas City District was then designated, remained unchanged except by the railway lines leading to the bridge, and by a considerable expansion of the small settlement of Harlem which was located at the Kansas City ferry landing (Fig. 2).

In the years 1887–1891 an unsuccessful attempt was made to extend Kansas City's urban structure into the present North Kansas City Dis-

trict. This projected development was a part of the great Kansas City real estate boom of 1885–1891 and failed with the collapse of that boom in 1891. Although this attempt to urbanize the district failed, it has

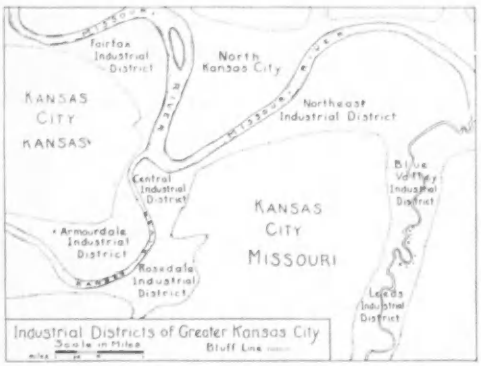


FIGURE 1.—The position of North Kansas City in relation to Kansas City, Missouri, and the Missouri River is apparent. All of the industrial districts are located in major stream valleys in order to be near the main railway lines which follow these lowlands.

affected subsequent urbanization there in three ways. First, it left a heritage of numerous small land holdings in Harlem and in that part of the district now known as Midway (Fig. 2). These holdings were originally residence lots sold during the boom by Mr. Willard E. Winner, the promoter. Their presence has since interfered somewhat with the unified development of certain industrial areas in the district. Second, the network of streets laid off by Mr. Winner has been extended over most of the present town of North Kansas City and consequently fixes the basic pattern of its structure. Third, the piers built during 1889–1890 for the proposed Winner Wagon Bridge were later used for the present North Kansas City Bridge, the chief link between the North Kansas City District and Kansas City, Missouri.

The present urban development of the North Kansas City District began in 1912. In that year, the opening of the North Kansas City Wagon and Railway Bridge greatly reduced the barrier effect of the Missouri River; and the completion of a levee along the river front and a drainage ditch along the foot of the bluffs removed the danger of flood. The toll charges on the bridge remained as a slight handicap for another fifteen years but the river barrier was definitely broken by the opening of the bridge.

The bridge, the levee, and the drainage ditch were made by the North Kansas City Development Company, a subsidiary of the Armour and Swift packing interests and the Burlington Railway. This company had bought almost all of the land in the district including the Winner holdings, during the years 1902–1912.

The bridge was built and the other improvements were made in order to open up the district and make possible sales of land to industries. The Company as a whole realized a profit on each sale of land, and the Burlington Railway in particular made additional profits by hauling freight into and out of the district. The attractiveness of the profits on switching and hauling was reaffirmed early in 1931 when the capitalists who control the Missouri Pacific Railway sought to divert these profits to their railway by purchasing the two-thirds interest which the Armour and Swift groups held in the Development Company.

Since 1912 the urban invasion of the North Kansas City District has continued with increasing velocity. However, in 1929 only one-third of the land was occupied by urban forms.[2] The remainder of this paper

[2] This figure was still correct in the fall of 1931.

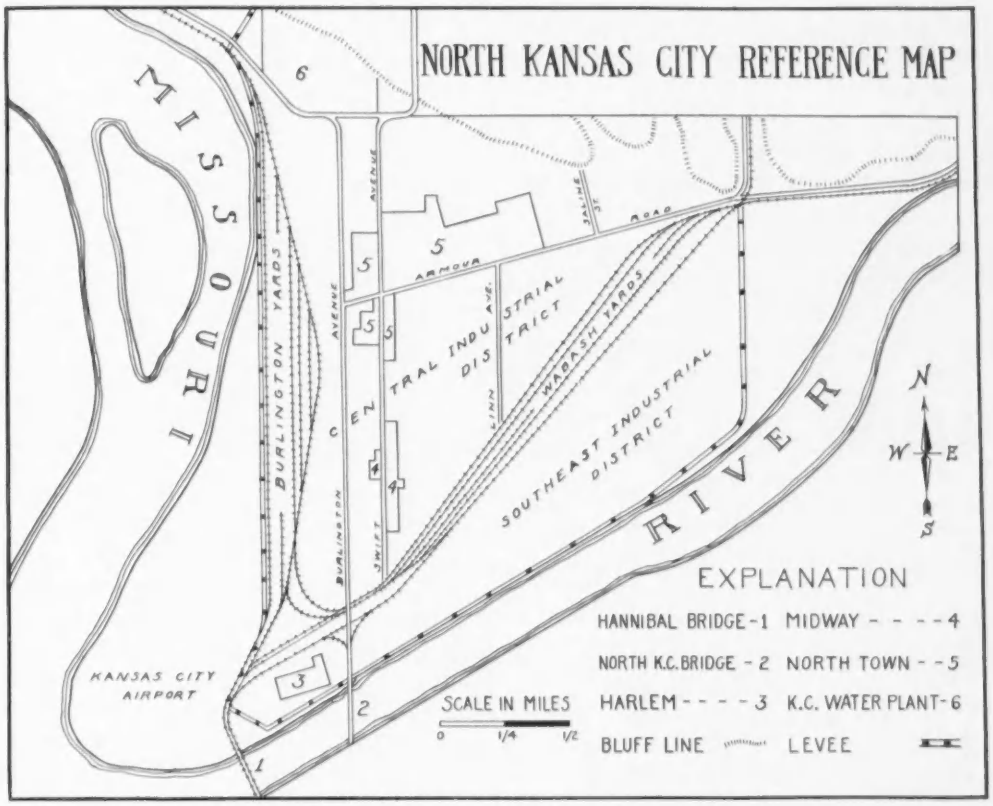


FIGURE 2.—After unsuccessful attempts to establish North Kansas City, the successful urban development of the district began in earnest in 1912 when the Wagon and Railway Bridge overcame the river barrier to expansion.

will show the present use of the land in the district and will explain how this peculiar distribution and grouping of the various cultural forms has been brought about.

INDUSTRIAL AREAS: ADJUSTMENTS TO REGIONAL PLANNING

The plan of the North Kansas City District as made by the Development Company provides for industrial, business, residential, and public uses. In general, the locations of these several areas are such as to conform to preëxisting natural and cultural features, to utilize to the best advantage the area owned, and to give economic unity to the district as a whole.

DISTRIBUTION AND CHARACTER

More than half of the district is set aside for industrial purposes, and, of this reserve, approximately one-third is occupied by various kinds of industrial establishments (Fig. 3 and Table 1).

The land used by the railways lies along the limbs of the railway "Y" (Fig. 2). This structural feature was created in 1869 when the first railway tracks were built across the bottom. The other industries, storages, distributors, factories, and one transport agency are located, irrespective of character, in some four separate areas. The basis of such distribution is sizes and shapes of

tracts required, and the comparative low cost of some of the irregularly shaped tracts.

Industries requiring only small blocks of land are, in the main, located in the plotted portion of the central Industrial Section. This plotted portion, lying west of Linn Avenue, is laid off in standard blocks measuring approximately 610 feet north-south by 270 feet east-west,

TABLE I

USE OF THE LAND IN THE NORTH KANSAS CITY AREA, APRIL 1, 1929

	Area in Acres	*Per Cent*
Industrial land	701	21
(Buildings)	(328)	(10)
(Railways)	(373)	(11)
Residential land	136	4
Business land	79	2
Public land	217	6
Agricultural land	1,539	44
Idle land	800	23
Total	3,472	100

the dimensions set by the original Winner survey.

The block pattern set by the Winner survey was adopted with slight modification because (1) the arrangement preserved the section lines, and (2) an examination of industrial areas in other cities convinced the Development Company that blocks of this size were satisfactory for most small- or medium-sized industries. The original Winner block pattern was changed so that alleys forty feet in width lie parallel to the north-south streets and divide each block into two equal parts. Block uniformity and alley width permit railway switch tracks to be built in each alley. As a result, each industry has access to at least one street and also to the switch track in the alley. The width of the alley, forty feet, permits each industry to have a private spur track leading from the main switch track. The decision of the Company to use

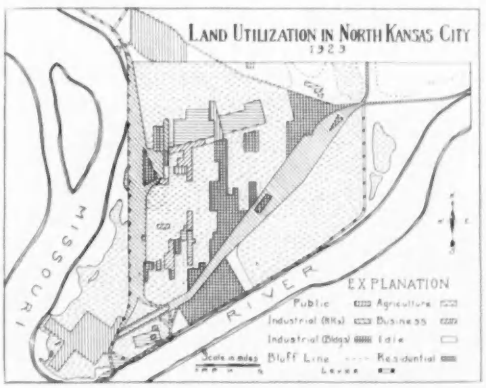


FIGURE 3.—The plan for development of North Kansas City provides for industrial, business, residential, and public use of the areas, so located as to serve most advantageously and economically the needs and activities of the section as a whole.

this block pattern has been justified as shown by the fact that three-fourths of the industries which have located in the North Kansas City District have fitted themselves successfully into these blocks.

Industries requiring large tracts of land, which may or may not be rectangular in shape, are located in three areas. These areas are (1) east of Linn Avenue in the central Industrial Section and east of Saline Street in the area north of Armour Road, (2) east of the North Kansas City Bridge in the southeast Industrial Section, and (3) along the east side of the Burlington Railway Yards. In these three areas no blocks have been plotted, and, as a result, individual buyers obtain large tracts suitable for their respective enterprises. The only restriction on the shapes and dimensions of land holdings in these areas is a proviso by the Development Company which prohibits holdings to be so arranged that switch tracks extending to them will cut the land into blocks of odd sizes and shapes, thus lowering its value.

The heavy traffic on Armour Road

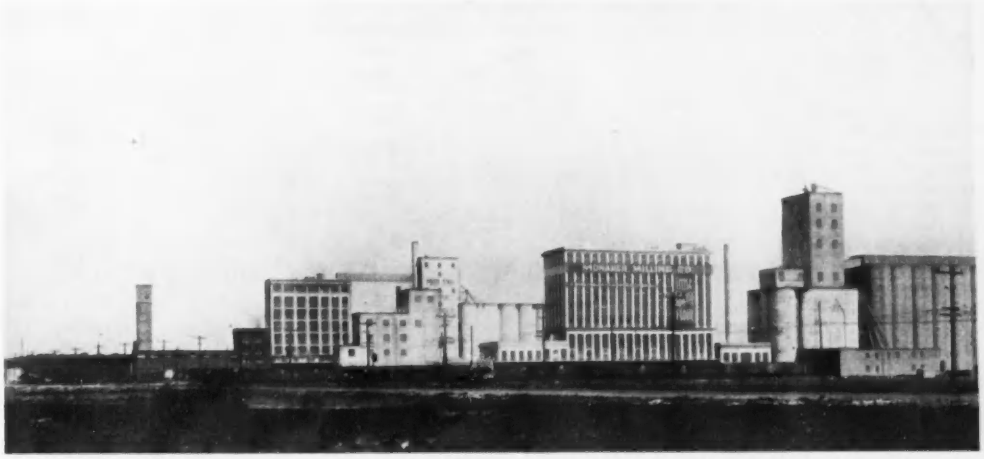


FIGURE 4.—The group of flour and feed mills near the eastern end of the district. Note the large number of railway cars on the switch tracks. The field of alfalfa in the foreground is separated from the mills by Armour Road which appears as a white line.

and on Burlington Avenue has prevented the extension of lead switch tracks into the land which lies north of and east of the Northtown residence area. Consequently, the only types of industries which can be developed in this part of the district are those requiring a small amount of railway service.

FORMS OF INDUSTRIAL BUILDINGS

In general, the larger holdings are occupied by large buildings. This measure of size applies either to the amount of ground space occupied by the buildings or to the number of stories built on a given ground space. The huge mills near the eastern end of the central Industrial Section stand out in any view of that end of the bottom (Fig. 4). The large paper board mill shown in Figure 5 is an example of a low building of great areal extent located in the unplotted section of the Central Industrial Section. In the area of plotted blocks west of Linn Avenue, the typical industrial building is smaller than in the other areas (Fig. 6).

Nine out of ten industrial buildings are made of steel and either brick or concrete. The Development Company strongly encourages this type of fireproof construction in order to obtain more favorable insurance rates.

The industrial areas of the North Kansas City District have been described and classified, and their grouping and distribution within the district, together with the general morphology of the buildings which they contain, have been presented. In the following section reasons will be given for the location in North Kansas City of the various industries which occupy the industrial areas.

LOCALIZATION OF INDUSTRIES

The conditions which caused the North Kansas City industries to locate within the district rather than in some other part of Greater Kansas City are given in Table 2. These data were obtained directly from the sixty-three industries which were established in the district in the spring of 1929. The outstanding attractions are cheap land, the availability of large tracts of level land,

TABLE 2

CONDITIONS WHICH ATTRACT INDUSTRIES TO THE NORTH KANSAS CITY DISTRICT *

	Major Attraction	*Minor Attraction*	*No Attraction*	*Did Not Report*	*Total*
Cheap land	33	..	9	21	63
Large tracts of level land	40	..	..	23	63
Switching facilities	35	26	2	..	63
Low taxes	4	53	3	3	63
Clean open spaces	..	63	..	..	63
Presence of another industry	15	1	35	12	63
Water supply	3	6	38	16	63
Nonpolitical utilities	6	..	..	57	63
Good highway connections	2	3	58	..	63

* As reported by the 63 industries located there April 1, 1929.

and the excellent switching facilities. Secondary factors of general application are the lower tax rate in North Kansas City in comparison with other parts of Greater Kansas City and the attractive appearance of the district as a whole. This latter condition is a result of (1) the absence of shacks, weeds, and other eyesores, and (2) the presence of open sunlit spaces between new industrial buildings.

FIGURE 5.—A large paper board mill. The building is limited in height in order to eliminate the expense of building floors and walls strong enough to support the great weight of the machinery and the paper. (Courtesy of the North Kansas City Development Company.)

Each of the remaining conditions listed in Table 2 is a minor locational factor. Only two plants are attracted to the district partially as a result of good highway connections with all parts of Greater Kansas City. The availability of a large supply of good water in the unconsolidated sediments underlying the district is an inducement to several factories; and the presence of certain large plants accounts for the influx of several auxiliary industries such as repair shops and box factories.

Nonpolitical control of all public utilities including streets, and the political separation of North Kansas City from Kansas City, Missouri, greatly simplify such problems as the opening and closing of streets and the extension of water mains and switch tracks. Officials of the North Kansas City Development Company claim that this factor is as important as any other one listed. Reluctance to commit themselves on a point so closely bound up with local politics may account for the silence of so many executives when asked about this factor.

In addition to the conditions listed in Table 2, which give the North Kansas City District some advantage over competing industrial districts, there are three factors of industrial location which apply with equal force to North Kansas City and its competitors. These factors are (1) nearness to regional markets, (2) nearness to supplies of raw materials, and (3) cost of high-grade labor. The first two conditions as measured by the cost of moving the goods are approximately equal for all the outstanding industrial districts in Greater Kansas City. The third factor shows even less variation from district to district.

At the present time the only handicap of the North Kansas City District in comparison with other industrial districts in the Kansas City metropolitan area is the local restriction on Mexicans and Negroes as owners of homes within the district. As a result of this restriction, these relatively unskilled laborers must be obtained from outside the district, thus causing some extra trouble in obtaining the desired labor force in a few plants. Hoewver, this difference is so slight that the three factories which employ this type of labor almost exclusively have operated within the district for years with no apparent handicap in comparison with similar industries located elsewhere in Greater Kansas City. Reasons for the exclusion of these groups from residence will be given in the next section.

The toll charges for the use of the North Kansas City Bridge were formerly a serious handicap to industrial development within the district. However, these charges were removed for all highway and pedestrian traffic on July 15, 1927, at which date the bridge became the property of Kansas City, Missouri, and Clay County. The bridge was purchased and made toll free in order to increase intercourse between Kansas City, Missouri, and the rich trade territory north of the river.

RESIDENTIAL AREAS: RECENT ALLOCATIONS AND REMNANTS OF PREVIOUS RÉGIMES

Irregularly distributed in the North Kansas City District are six residential areas, unequal in size and occupying some four per cent of the total area of the district.

The distribution of these areas is due in part to regional planning, and in part to a number of interrelated conditions, some of which no longer are pertinent.

DISTRIBUTION, ORIGINS, AND FUNCTIONS

The three larger sections are (1) Northtown, lying north of Armour Road; (2) Midway, lying along South Swift Avenue between Tenth and Fourteenth Avenues; and (3) Harlem, located between the north approaches to the North Kansas City and Hannibal Bridges (Figs. 2 and 3). Of the three smaller groups of residences, one is on the levee near Harlem, another is on an old county road between Midway and the Burlington Yards, and the third is in the Burlington Yards.

FIGURE 6.—A typical small factory of modern construction located on South Burlington Avenue.

Northtown was created by the Development Company in order to provide homes for industrial workers. The levee front area is a dwelling place of squatters who live here on Uncle Sam's land and pay rent to no man. Three small farmsteads on the County Road have been left over from the days before urban forms invaded the district. The group of small houses in the Burlington Yards was built by the railway

in order to house a group of Mexican laborers. The origins of Harlem and Midway have been explained in an earlier section.

The main function of each of these areas is to serve as a place of residence for people who work in North Kansas City (Table 3). A fairly high percentage of the earners from Midway, Harlem, and the Levee Front are employed in Kansas City, Missouri. This is due to the fact that these residence groups are as near to many of the industries located on the south side of the river as they are to most of the industries in North Kansas City. For example, a resident of Harlem who is employed in one of the nearby Kansas City industries lives no farther from his work than if he were employed north of the river. Nevertheless, even these marginal residence areas show a majority of earners employed in North Kansas City.

FIGURE 7.—A row of bungalows in Northtown. These houses are built inexpensively, but they are new and well kept, and the streets are paved and clean.

TABLE 3

AREAS IN WHICH NORTH KANSAS CITY WAGE EARNERS WERE EMPLOYED, APRIL 1, 1929

Where Earners Lived	Areas Where Earners Were Employed				*Totals*
	North Kansas City	*Kansas City, Missouri*	*Both North Kansas City Area and South Kansas City, Missouri*	*Outside Greater Kansas City*	
Midway	24	2	2	2	30
Burlington yards	4	..	..	..	4
County road	1	..	..	..	1
Harlem	22	10	3	1	36
Levee	5	3	1	..	9
Northtown	308	54	3	5	370
Totals	364	69	9	8	450
Per cent	80.89	15.33	2	1.78	100

areas, the Levee Front, may be removed entirely at any time if the National Government should decide that the presence of these squatters is undesirable. Northtown, however, has been expanding steadily since its foundation in 1911. It has been growing because most of the newcomers to the district prefer this area. It is new, clean, well planned, restricted so as to exclude undesirable neighbors, and is closer to both the industrial and business sections than any of the other residence areas. Midway is as near as Northtown to the southwestern part of the industrial area but lacks all the other advantages of the newer area.

NORTHTOWN: A RESIDENTIAL AREA DEVELOPED BY INDUSTRY

Northtown is the only residence area which is growing. In Harlem and Midway a few houses are built from time to time, but these merely replace the old houses which are destroyed by fire, or decay. The three smaller residential areas are completely stagnant. One of these

The advantages of Northtown are results of the plans of the Devel-

opment Company. The Company desired to attract industries to the district, and, in order to do so, it provided a residence area and business section for those workmen who desired to live near their places of employment. This was the beginning of Northtown. The clean appearance of the Northtown area and the restrictions against certain racial groups—Mexicans, Negroes, and South Europeans—are also results of the policy of the Company to make the town attractive to the skilled workmen. In order to provide a steady and competent body of citizens and workers, the Development Company builds houses for sale only. Also, before land is sold to other real estate enterprises, they are required to agree that houses will be built immediately and sold as soon as possible.

RESIDENCE FORMS

The typical North Kansas City dwelling is a one-story frame bungalow containing five rooms, bath, and basement (Fig. 7). This is the workingman's cottage in its Midwestern form. The predominance of the small one-story, single-family dwelling is shown by the fact that 88 per cent of the residences are of this type. Many of these have been built to sell at a fairly low price. Others are of a better class. Almost all of these cottages are built on lots 35 feet wide and from 120 to 130 feet deep.

About 45 per cent of the homesteads have garages, and an additional 25 per cent have buildings other than garages. These sheds and outhouses are restricted almost entirely to Harlem, Midway, and the County Road, and are necessary because of the lack of sewerage in Harlem and the scarcity of basements in all three areas. The sheds are used to hold fuel and other supplies. The scarcity of garages is explained by the fact that most of these homes are not yet paid for and the families that are making the payments feel that they cannot afford to pay for a car and a garage in addition.

All but three of the thirty-five multiple-family dwellings are in Northtown. Most of these are large two-story frame houses and are either duplexes or have been converted into light housekeeping apartments. Only one large apartment building has been constructed. This large brick building, containing twenty-four apartments, is located near the center of Northtown.

BUSINESS AREAS: ADJUSTMENTS TO LOCAL AND TRANSIENT POPULATIONS

Eighty-eight business houses were established within North Kansas City April 1, 1929. They occupied only two per cent of the land in the district (Fig. 3 and Table 1). These 88 establishments were distributed among seven business areas as follows: Northtown 69, Midway 7, South Burlington Avenue 7, central Industrial Section 2, Harlem 1, Airport 1, and the Burlington Yards 1.

DISTRIBUTION, ORIGINS, AND FUNCTIONS

The business areas originated in various ways. The Northtown area was created by the Development Company in order to serve the Northtown residential section. The Midway and Harlem areas began as supply centers for their respective residential sections. On the other hand, the South Burlington Avenue areas have no tributary residential section but serve the highway traffic.

FIGURE 8.—The Armour Building in the Northtown business area. Note the different lines of business in this one uniformly built structure.

Most of the firms in this area have been established since the tolls were removed from the North Kansas City Bridge, *i.e.*, since July 15, 1927. The Development Company has permitted one filling station to be established on its land in the central Industrial Section and has encouraged the location of a branch telegraph office in that area.

The combined restaurant and rooming house in the Burlington Yards was built before the use of the automobile became general. Its purpose was to serve the needs of those employees of the railway who desired to live near their work. Now that the men can drive from either North Kansas City or Kansas City in a few minutes, the need for the business is gone and it is on the point of failure. In contrast to this the Aeroplane Taxicab Company, the only local business concern at the airport early in 1929, was joined by three other local business firms before the end of that year.

The functions of these eighty-eight business firms are shown by Table 4. Sixty-three per cent of their business is with the North Kansas City District. Their trade with the farmer is surprisingly small. Four-fifths of their business with Clay

TABLE 4

DISTRIBUTION OF TRADE OF ALL NORTH KANSAS CITY BUSINESS AREAS

Business with	*Per Cent*
North Kansas City town	46
North Kansas City industries	17
Clay County suburban areas	25
Kansas City, Missouri	3
Highway users	9
Total	100

County is confined to the suburban commuter who goes through North Kansas City on his way to work in Kansas City. The farmer from southern Clay County takes his produce across the river to the Kansas City market and spends his money in that city. The three per cent of the trade assigned to Kansas City is probably not all of the business with that city. No doubt a large part of the trade designated as going to the highway users also should be given to Kansas City, but the North Kansas City merchants were unable to determine the homes of these transient customers. Most of them were evidently townspeople.

KINDS OF BUSINESS ESTABLISHMENTS

As a result of its varied trade, the Northtown business area contains many different kinds of business establishments. The firms in that area include every line of business commonly found in a small city in the Middle West.

The business establishments in the other business areas are limited in kind as well as in number. For example, Midway has two filling stations, two automobile repair shops, one lunch room, one grocery store, and a workingman's hotel.

The large percentage of firms in Midway which depend upon trade with automobile owners is due to the fact that Swift Avenue was the main north-south highway before Burlington Avenue was cut through in 1926. All of the seven firms on

South Burlington Avenue are filling stations.

FORMS OF BUSINESS BUILDINGS

Most of the firms in the Northtown area are housed in buildings similar to the one shown in Figure 8. There are six of these buildings, all built and owned by the Development Company. Each is occupied by several business firms. Five of the buildings are made of brick, concrete, and wood. The sixth is constructed of brick, concrete, and steel.

It is the practice of the Development Company to delay the construction of a new building until several business firms are ready to sign leases. The Company then constructs a large building to suit their needs. For example, one building constructed in 1928 (Fig. 8) contains a motion picture theater, a large restaurant, one large and two small store rooms, one ground floor office, and, on the second floor, four more offices and a suite of club rooms for the North Kansas City Chamber of Commerce. All of these spaces except the second floor offices were leased before the building was erected. As is the case in many small towns, there is little demand for multiple story buildings. The cheapness of the ground space permits buildings to spread out rather than up. Consequently, certain parts of these buildings are only one story in height.

In Midway all but one of the business buildings are of the small one-story type. Several are built of wood. The remainder are wood and brick. The one large building in this area is the old Winner Block, now the Palmer House, a workingman's hotel.

South Burlington Avenue is characterized by filling stations of the conventional type. There are several reasons for the concentration of so many filling stations in such a small area. The heavy traffic on the highway is the chief reason. Another reason is that prior to the autumn of 1929 there was no municipal tax on gasoline in North Kansas City. At that time the Kansas City municipal gasoline tax was two cents per gallon, and, as a result, these North Kansas City stations could offer the outgoing Kansas City motorist his first chance to "save the city tax." This advantage of the North Kansas City filling stations was reduced one-half in the fall of 1929 when a city gasoline tax of one cent per gallon went into effect.

The Central Industrial Section contains only two business houses, a telegraph office, which uses a small brick and concrete building built for it by the Development Company, and a filling station.

The store at Harlem is a wooden structure similar to many general stores in small rural communities in Missouri.

PUBLIC AREAS: ADJUSTMENTS TO LOCAL AND METROPOLITAN NEEDS

Six per cent of the land in the North Kansas City District exclusive of land in streets is devoted to public use. However, with the exception of the State Highways, the areas occupied by the streets are legally parts of adjacent blocks of land, and as such have the status of private ways. This charter provision was included in order to prevent picketing in case of strikes.

SCHOOLS

Public schools occupy two blocks of land, one being occupied by the Harlem Grade School and the other

by the North Kansas City High School and the Macelroy-Dagg Grade School, located near the center of Northtown.

These schools accommodate the grade school pupils in North Kansas City and all high school pupils in School District Number 74, the boundaries of which include all of the North Kansas City District and an additional area extending some three miles north.

FIGURE 9.—The relation of the Municipal Airport to the Kansas City business area is apparent. The Hannibal Bridge is the connecting link. (Courtesy of the North Kansas City Chamber of Commerce.)

The Harlem Grade School serves Harlem, Midway, the County Road, and the Burlington Yard; the Macelroy-Dagg Grade School serves the Northtown residence area; and the High School serves the entire school district. The total enrollment in these schools for the school year 1930–1931 was 1,450 students.

Each of these schools is located near one of the two centers of school population. The Harlem Grade School is in the Harlem residence area rather than in Midway because a school was in existence in Harlem long before Midway was settled. The tracts used by the High School and by the Macelroy-Dagg Grade School were reserved for these purposes by the Development Company in its original plan of Northtown.

The Harlem School is a small three-room wooden structure, while the Macelroy-Dagg School and the High School are large modern buildings constructed of brick, concrete, and steel, and are as nearly fireproof as possible.

LOCAL WATER WORKS AND CAR BARNS

The street car barns and the pumping plant of the North Kansas

City water works system are located on the west side of Burlington Avenue opposite its junction with Armour Road. This site is near the Northtown business and residential areas and is also close to the Central Industrial Section. Such a location is important for the pumping plant because it eliminates unnecessary extension of water mains. A two million gallon water reservoir is located on top of the bluff north of Northtown. The water in this reservoir maintains the pressure in the water mains. The head is approximately 130 feet. The street car barns might have been located at almost any other point along the car line, but the Development Company chose to place them near the water pumping plant. Both the car barns and water works are small, but substantially built, structures of brick, concrete, and steel.

LOCAL TOURIST PARK

A small tourist park of about five acres is located south of the Northtown business area. This block of land was set aside as a park because (1) it contained a grove of large trees, and (2) it was near the center of Northtown. The only buildings consist of several small sheds and rest houses and a few open air stone ovens. The park is used chiefly by tourists, gypsies, and a band of semi-domesticated red squirrels.

KANSAS CITY MUNICIPAL WATER WORKS

The Kansas City Municipal Water Plant is located at the northwest corner of the North Kansas City District. This plant was started in 1924, finished in 1928, and after numerous tests and delays, began full-time operation in March, 1930.

The North Kansas City site was chosen after an exhaustive study had been made of many possible sites. The advantages of the North Kansas City site are as follows: (1) it is in the State of Missouri and thus free from possible state taxation, (2) the river channel is deep near shore and can be held permanently in this channel at small cost, (3) high ground above flood level is available for all reservoirs and buildings, (4) there is plenty of room for future expansion of the plant, and (5) the site is near Kansas City.[3]

The brick, concrete, and steel buildings, reservoirs, and tunnels which make up the plant are built to give continuous and uninterrupted service for many decades.

KANSAS CITY MUNICIPAL AIRPORT

The Kansas City Municipal Airport occupied all but six acres of the land between the west side of the Burlington Yards and the Missouri River. Kansas City bought the land in 1928, and was given title to 687 acres of land. However, this area is not included within the levee district, and, as a result, the river has carried away approximately 104 acres of land. Consequently, in 1929 the total amount of dry land in the area was approximately 583 acres. The original size of the land area is to be restored by the National Government. In pursuance of this objective a series of retards were built along the west side of the area during the summer of 1930. The river is rapidly filling in sand behind these retards.

In April, 1929, only 106 acres, or less than 20 per cent of the total

[3] Mr. T. D. Samuels, Chief Engineer, Kansas City, Missouri, Water Department, personal interview.

area of dry land then existing, was used for aviation purposes. Two hundred thirteen acres were in crops, and the remaining 264 acres were idle. The land devoted to aviation was the only part used as public land. As a result, this is the only part shown as public land on the Land Use Map of 1929 (Fig. 3).

The Kansas City authorities chose this block of land in the North Kansas City District for a municipal airport after an investigation of seven possible sites had shown this one to be the best. The chief advantage of the North Kansas City site is its location near the heart of the main business section of Kansas City (Fig. 9). In almost all other respects the block of land measures up to the basic requirements for airports as laid down by the Aeronautics Branch of the United States Department of Commerce. In addition, the price of the land per acre was not considered to be high. The cost of the airport area was relatively low because it was not protected by a levee, and, as a result, the land was idle or in crops. The large size, flatness, good drainage, and low cost of the area made it a possible choice, but its location within a five-minute drive of the main business section of Kansas City made it the final choice of the municipal authorities.

Buildings on the airport are all new and of the latest design. The hangars are built of steel and concrete in order to reduce the fire hazard. They measure 80 by 100 feet. Other buildings on the port are made of brick, concrete, and steel. The passenger station is a good example of this type of architecture. In addition to the buildings constructed on the port there is a 2,000-foot concrete runway connecting the main group of buildings. This gives a firm footing to both aeroplanes and passengers and prevents dust and water from being blown on the bystanders when the aeroplane engines are speeded up. The three landing runways have been covered by a six-inch layer of cinders which forms an all weather surface.

In the fall of 1928, one local air transport concern and three regional transport lines were using the port. In the fall of 1931 ten regional transport lines, one aeroplane factory, one aeroplane supply house, and the national headquarters and shops of the Transcontinental Western Air Express Company were located within the area. Undoubtedly, the Kansas City Municipal Airport is developing into a separate industrial area with interests other than those of the older industrial sections of the North Kansas City District.

AGRICULTURAL AREAS: RESERVES FOR URBAN USES

Although the land of the North Kansas City District primarily is intended for urban uses, approximately 44 per cent of the district is used for agricultural purposes (Fig. 3 and Table 1). Crops occupy the agricultural land in the following proportions: corn 41 per cent, alfalfa 32 per cent, and wheat 27 per cent.

More land is devoted to agriculture than to any other human use because the North Kansas City District was formerly an agricultural district and it has not yet attracted enough urban forms to occupy all of the available land. The district as an urban development is young. In another twenty years or so most of the land should be occupied by buildings, streets, railways, and other urban forms.

All of the agricultural land is in cultivated crops because (1) the soil is fertile enough to stand repeated cropping without greatly reducing the yield from year to year, and (2) the owners of the land object to the presence of any farm animals within the area.

FIGURE 10.—This cornfield lies along the foot of the bluff hidden from the main road by the houses of Northtown, seen on the right, and well away from the mill buildings and greenhouses which appear in the background. Compare with Figure 4.

If the main objective of the North Kansas City farmers is to grow money crops, it would appear that all or most of the agricultural land should be given over to corn, the most profitable crop. Yet, in 1929, 32 per cent of the land was in alfalfa and almost a third, 27 per cent, was in wheat. Also, the corn was not permitted on some of the best land, *i.e.*, that in the Central Industrial Section. Both of these anomalies are explained by the fact that the land in the North Kansas City District is owned and exploited by people who are interested in the sale or leasing of city real estate rather than the production of crops. Consequently, only alfalfa and wheat or some other low-growing crop may be grown on or near the land shown to real estate prospects. Corn is banished to the outer parts of the area where it is relatively inconspicuous on the landscape (Figs. 4 and 10).

The disadvantages of corn fields and the advantages of alfalfa fields to the real estate salesman are best explained in words of one of the Development Company's officials. He said, "One cannot ask a man city real estate prices for a corn field. He tends to think of the plot as a farm rather than as a factory site or home site. On the other hand, a nice green field of alfalfa or young wheat creates a better impression than bare ground or growing weeds."

IDLE AREAS: MARGINAL AND TRANSITIONAL

Two small blocks of idle land are located within the Northtown business section. They are not large enough to be farmed and they have not yet been occupied by business buildings.

Several small irregular blocks of land in the neighborhood of the Kansas City Municipal Water Plant are unused because (1) they are too irregular in shape and too far from the developed areas to attract urban forms, and (2) their owners have not seen fit to plant crops on such small irregular plots.

A large block of land between the Wabash Yards and the river has been idle for several years because it is held as a factory site by a company which keeps postponing its building program until economic conditions are more suitable.

Each of the remaining areas of idle

land is handicapped by some physical defect. The blocks of land on the upland are too steep and too deeply dissected to be used for urban forms or even farmed profitably. The land outside the levee on the east has been formed by the river since the levee was built and is unused because no title can be established without prolonged litigation. The idle land around the municipal airport formerly was occupied by trees and brush. In the spring of 1929 the trees were removed from all but the northern part of the tract because they were an obstruction to the aeroplanes using the port. The stumps were cut very low but nevertheless they prevent the use of the land for cultivated crops. The small block of land east of the north approach to the North Kansas City Bridge has remained idle because it is made land too new and raw to be farmed and it is not occupied by urban forms because it is reserved by the Company for future railroad rights of way which will converge on the lower deck of the North Kansas City Bridge.

CONCLUSIONS

The North Kansas City District has a cultural landscape of marked individuality among industrial districts due to the influence of a peculiar combination of physical and cultural factors. Although agricultural forms occupy more land within the district than all types of urban forms combined, the latter are more significant of future developments because they are expanding steadily at the expense of the former. The dominant urban forms are the industries because with a few exceptions all of the other forms merely support and supplement them.

It is probable that the rapid growth of Kansas City, Missouri, eventually would have brought about industrial development in the North Kansas City District, but such development has been stimulated greatly by the North Kansas City Development Company. The plans of this company determine the types of urban forms (industrial, residential, business, and municipal) which are admitted to the district and also direct the grouping of these cultural forms within the present landscape structure. The plans of the Company are in turn adjusted to (1) the outstanding physical features, especially the river and the flat bottom land, and (2) certain preëxisting cultural features such as roads, railways, bridges, and small villages.

The chief factors which attract industries to the North Kansas City District are the presence of large blocks of cheap level land, excellent switching facilities, and low taxes. Minor attractions are local customers, cheap water, and the absence of political technicalities.

The necessity of insuring a desirable labor supply which would attract and hold industries led the Company to develop a new village with house types and prices suited to the workingman's needs. The Northtown business section was created as a necessary adjunct to the new residence area, and, as a result, has been carefully restricted so as to conform closely to the actual needs of the community.

Although the North Kansas City District is politically independent of and physically separated from the remainder of Greater Kansas City, certain economic, social, and municipal connections exist between the two areas and will probably continue.

Eventually, factories, warehouses, railways, stores, houses, and streets will occupy almost all of the land within the North Kansas City District; structural areas will retain their present outlines with minor variations; further changes in the cultural landscape will be slow in developing due to the increasing cost of the land; and the district as a whole will be a stable, prosperous, Midwestern, industrial community.

BOOK REVIEWS

NOTE.—The Agricultural History Society will be glad to send to anyone who requests it, a reprint of Doctor Ellen Churchill Semple's "Ancient Mediterranean Agriculture" which originally appeared as two instalments in *Agricultural History* for April and July, 1928. This article is essentially the same as Chapters 14 and 15 of her book, *The Geography of the Mediterranean Region; Its Relation to Ancient History* (New York, Henry Holt & Company, 1931). Address Doctor Everett E. Edwards, Editor, Agricultural History, Room 3035, South Building, 13th and B Streets, S. W., Washington, D. C.

UNITED STATES DEPARTMENT OF COMMERCE

BUREAU OF FOREIGN AND DOMESTIC COMMERCE

Seasonal Trends of Rubber. Trade Information Bulletin No. 804. Price, 5 cents.

The production of rubber elsewhere than in the Middle East is negligible. Crude rubber in each area is being closely analyzed at present by all elements of the trade for indications as to the future course of exports, changes from past normal production policies, and particularly for evidence of the extent to which producers in different regions of the Middle East are curtailing their output of rubber.

Motor Fuels in Foreign Countries. Trade Information Bulletin No. 805. Price, 5 cents.

The purpose of this publication is merely to present the available facts with a brief discussion in a few instances, relative to the subject of substitutes for petroleum motor fuel in foreign countries.

The Leather Industry and Trade of Belgium. Trade Information Bulletin No. 806. Price, 5 cents.

With American tanners finding it more difficult, owing to existing conditions, to find favorable outlets for their surplus leather production, it is interesting to note that Belgium is expected to increase its purchases of leather from the United States.

Foreign Trade of the United States in the Calendar Year 1931. By Grace A. Witherow. Trade Information Bulletin No. 808.

Despite the fact that foreign trade dropped considerable both in volume and value during 1931, the United States maintained its position as the world's leading export nation and ranked in the usual order, next to the United Kingdom, in value of imports.

A Basis for Supervision of Industrial Sales Personnel. By G. Reed Salisbury. Domestic Commerce Series No. 62.

Preparing Shipments to Canada, Documentation and Customs Entry. Trade Promotion Series No. 91 Rev.

The volume of export trade from the United States to Canada rivals the trade with England for first place, and in some years exceeds it.

The Balance of International Payments of the United States in 1931. By Amos E. Taylor. Trade Information Bulletin No. 803.

These annual surveys are reports on our international transactions from the standpoint of banking and foreign exchange. They are undertaken primarily for the benefit of those interested in the financial aspects of our foreign trade. In practice they have served an even wider purpose because of their relation to domestic and international economic problems generally.

Tung Oil. Economic and Commercial Factors in the Development of a Domestic Tung Oil Industry. Trade Promotion Series No. 133.

Tung oil has assumed world-wide prominence as an essential raw material. This product, obtained from the seed of a species of tree native to central and southern China, is the best drying and waterproofing oil of vegetable origin known to technical science. Establishment of a tung-oil industry in the United States undoubtedly will be a distinct boon to Florida, Mississippi, and the other Gulf States. The planting phase of this industry represents a splendid contribution to the diversification of southern agriculture, providing an economic use for certain waste and uncultivated land and an added channel of activity for labor in that region. In addition, the erection and operation of mills for the commercial expression of the oil may directly amplify industrial activity in the Gulf States and may tend to encourage the movement of paint and varnish and other consuming industries to southern plant locations.

American Underwriting of Foreign Securities in 1931. Trade Information Bulletin No. 802.

German Chemical Developments in 1931. Trade Information Bulletin No. 795.

COAST AND GEODETIC SURVEY

Tide Tables, Atlantic Coast, North America, 1933. Price, 15 cents.

Tide Tables, Pacific Coast, North America, Eastern Asia, and Island Groups, 1933.

BUREAU OF MINES

Gold, Silver, Copper, Lead, and Zinc in Utah in 1930. Mine Report. Mineral Resources of the United States, 1930. I:21.

Gold, Silver, Copper, Lead, and Zinc in Idaho and Washington, 1930. I:22. Mine Report.

Copper in 1930 (General Report). I:24.

Fluorspar and Cryolite in 1931. II:1.

Petroleum in 1930. II:30.

Summarized Data of Tin Production. Economic Paper 13.

Contains a map of the world showing the geographical distribution of world tin production, 1930.

Gold Mining and Milling in the United States and Canada. Current Practices and Costs. Bulletin 363. Price, 15 cents.

BUREAU OF THE CENSUS

Products of Manufacturing Industries, 1929. Census of Distribution.

How to Use Commodity Sales Data in State Reports and the Significance of Such Data. By John Guernsey.*

This booklet is of special interest. It describes the data available for the first time on *sales by commodities*. It outlines various uses to which commodity data may be put by manufacturers, wholesalers, retailers and by advertising agencies. By means of the method described in this booklet, and the Commodity Tables in the final series of State reports of the Retail Census, it is possible to determine the approximate total sales of more than 200 specific commodities, as well as to show the relative importance of various kinds of businesses as sales outlets for different commodities.

Retail Distribution, State Series, MASSACHUSETTS. Distribution No. R-102.

Retail Distribution, State Series, OHIO. Distribution No. R-104.

Retail Distribution, State Series, NEW MEXICO. Distribution No. R-103.

Ownership Groups of Department Stores. Retail Distribution, Merchandising Series. Distribution No. R-69. Price, 5 cents.

Drug Store Chains. Retail Distribution, Merchandising Series. No. R-66. Price, 5 cents.

Furniture Chains, Including a Section on Other Home-Furnishings Chains. Merchandising Series No. R-64. Price, 5 cents.

* In Charge of Census of Retail Distribution.

Jewelry Chains. Merchandising Series No. R-65. Price, 5 cents.

Shoe Chains. Merchandising Series No. R-67. Price, 5 cents.

Motion Picture Films. Wholesale Distribution, Trade Series. No. W-201.

Radio Sets, Parts and Accessories. Wholesale Distribution, Trade Series. No. W-202.

California, Oregon, Washington. Census of Mines and Quarries: 1929.

Drainage, Summary for the United States 1929 and 1930.

Contains a map of the United States showing approximate location of land in drainage enterprises.

Cotton Production in the United States. Crop of 1931. Price, 5 cents.

Wholesale Distribution, State Series: Arizona; Arkansas; Maryland; Montana; New Hampshire; Oklahoma; Utah; Virginia; Wisconsin. Price, 10 cents each.

Manufactures: 1929, State Series: Florida; Louisiana; Montana; Nevada; New Mexico; North Carolina; North Dakota. Price, 5 cents.

Occupation Statistics. By States: Illinois; Ohio; Pennsylvania; Texas. Price, 10 cents.

Construction Industry. An analysis of the construction industry of the United States. Distribution No. C-175.

Construction Industry, State Series: Arkansas; District of Columbia; Iowa; Maine; Maryland; Massachusetts; Montana; New Hampshire.

Population Bulletin, Families, State Series: Alabama; Connecticut; Idaho; Montana; Nevada; New Mexico; North Dakota; South Dakota.

Agriculture, Statistics by Counties, Third Series, Type of Farm: California; Colorado; Florida; Idaho; Iowa; Indiana; Michigan; Montana; Nebraska; New York; Ohio; Pennsylvania; Washington. Price, 10 cents.

Agriculture, Forest Products Cut on Farms and Nurseries and Greenhouses.

Contains a map of the United States showing sales of nursery and greenhouse products in 1929, one dot equals $25,000.

Agriculture. Type of Farm. Summary for the United States 1929 and 1930. Price, 10 cents.

Agriculture. Volume II, Part 3. The Western States. Reports by States with Statistics for Counties and a Summary for the United States.

BUREAU OF STANDARDS

The International Metric System of Weights and Measures. Misc. Publication No. 135.

A synopsis of the metric system is given which shows the derivation of the primary units, their interrelation one with another, the method of forming the multiples and submultiples, the abbreviations used, comparisons of the units with those of our customary system of weights and measures, and tables of equivalents.

MILDRED R. BASHORE

MOULTON, HAROLD G. with the collaboration of JUNICHI KO. *Japan—An Economic and Financial Appraisal.* 25 chapters, 645 pages, index, graphs, and tables. Brookings Institution, Washington, D. C., 1931. $4.00.

In these days of Oriental strife, world depression, and general unrest, there is a distinct need of a more thorough understanding of existing conditions in neighboring countries. This book, written by Doctor Moulton under the direction of the Brookings Institution, is a comprehensive scientific investigation of Japan's economic and financial condition. For the teacher or student of geography, economics, international relations, or commerce it is invaluable. It is a clear, concise, authentic, and interesting study of this Oriental country.

Doctor Moulton is a recognized authority in his field of economic writings. He has written many outstanding articles, some of which are: "Germany's Capacity to Pay," "The Reparation Plan," "French Debt Problem," "World War Debt Settlements," "St. Lawrence Navigation and Power Project," and many others. This publication on Japan is an outstanding study.

The book is divided into five parts. The first is a clear, concise statement of the history, system of government, geography, and resources. The digestion of the material within this first section gives one a fine introduction to the Island Empire.

The bulk of the book is in Part 2 under the heading of "Economic Development." The contents of the chapters in this section and their arrangement take one through a wealth of well-organized material. The reader will better understand by reading the chapter headings, which are: "Utilization of Natural Resources," "Development of Transportation," "Public Utilities," "Industrial Development," "Domestic Trade," "Financial Organization," "Insurance," "Public Finance," "Public Debt," "Foreign Trade," "International Financial Relations," and "The Growth of National Wealth and Income." No better insight into the life and problems of Japan could be gained than from the reading of these chapters.

The part taken by the government in regulating and assisting industry is taken up in Part 3, under the heading of "Integration and Interpretation." There is a short chapter on "An Epoch in History," followed by "Government and Economic Activity," "Economic Effects of Fostered Industrialism," "Social Consequences of Economic Expansion," and "The Expansion of Population." Much of the present-day industry of Japan is due to the governmental assistance.

Part 4 is devoted to "Problems and Policies Today." Within this part are chapters on "The Maintenance of Financial Stability," "Credit Organization and Interest Rates," "The Coordination of Transportation Development," "Industrial Potentialities," and "Reorientation of Commercial Policy."

In the last part of the book under Appendix A, there are fifty-five pages devoted to an "Analysis of the International Debt and Investment Position." In Appendix B there are seventy-six pages of statistical matter. The index is extremely helpful in this type of a book.

At the back there is a list of the publications of the Brookings Institution.

In a brief summary at the end of Part 4 are four points listed for the correction of basic problems:

(1) A fundamental requirement for sound economic development is the maintenance of financial stability. The maintenance of international trade and financial equilibrium will depend primarily upon the nation's ability to expand exports, particularly of finished manufactured products.

(2) There should be a general reduction in money rates if Japan is to find employment for her rapidly increasing labor supply and at the same time expand exports as a means of paying for increasing imports of foodstuffs and raw materials.

(3) Development of a nation-wide system of good roads is a need of conspicuous importance.

(4) Japan's industrial future depends primarily upon the expansion of manufactured exports to two important trade areas—continental Asia and North America.

Japan's problem in the not distant future is to find some means of controlling her population increase or find an outlet for her people in other lands.

A wealth of valuable up-to-date material is to be found in this book. To read the book is a pleasure, to own one is to possess a volume of inestimable value.

LAURENCE F. FOUNTAIN

SAND, ALGO. *Señor Bum in the Jungle.* 319 pages; illustrations. National Travel Club, New York, 1932.

"Up the Orinoco, Down the Rio Negro, and Out the Mighty Amazon"—the subtitle, especially as it is displayed on the animated map of the end papers, may attract readers who think "Señor Bum in the Jungle" is the title of a novel or at least not indicative of an instructive and interesting travelogue. Señor Bum, however, is an American who bums his way along the jungle

highways of South America in the same manner, if not under quite the same conditions, as thousands of men do on the roads of North America. Algo Sand started out along unknown paths in blissful ignorance, knowing only that the Orinoco and the Rio Negro seemed to make connections on the map and that the latter flows into the famous Amazon. It took him nearly two years to make the trip, but only a few weeks to lose all his supplies and become a bum for the rest of the journey,—"Señor Bum" to most of his acquaintances and traveling companions, who had no idea what he meant when he tried to define for them the uncomplimentary word.

Scientific exploration results in one kind of trip, and aside from the scientific reports some member of the party may write a less serious account of his experiences. But as a rule the expedition goes through with the aid of more or less money and the equipment money can buy. Most travelers know something of where they are going and about how long they will give to the journey, and they set forth with sufficient means to see themselves through. Algo Sand graduated from a tool sharpener employed by an oil company in Maracaibo, Venezuela, to an "explorer," on one tropical evening when a trip to town and fever called away two participants in the usual nightly poker game. As a result those remaining were "fooling with a map," and Sand, tool sharpener, contracted wanderlust. Thus it is that the author of this book of travel had no scientific aspirations or traveler's plans; but before he had been long on the way he had very little else, either, and his take-it-or-leave-it journey up the Orinoco proves the truth of his assertions that he was neither scientist nor explorer but a "bum."

After various misadventures had left him possessionless except for the ragged clothes on his back, Algo Sand became Señor Bum, a lone American working his way through the jungle. In the few towns he passed through he became, as "Americano," the lion of the day; but many of the places to which he was directed proved to be a single hut sheltering a large family of miserable natives. Everywhere he was treated as an honored guest or, if he stayed long enough, as a member of the family. His progress was slow, and his steps often retraced, but he was in no hurry and often spent weeks or a month just awaiting developments or on side trips to witness some tribal ceremony. He says he attributes much of his success to living as the natives did wherever he was. It was a case of "when in Rome" that worked greatly to his advantage if not to his immediate comfort. Certainly Señor Bum's experiences are unconventional and give us glimpses into the life of natives and Indians of Venezuela that many a true explorer would not suspect.

One might feel inclined to question the validity of Mr. Sand's subtitle, although strictly speaking it does tell the truth. He does come down the Rio Negro and out the mighty Amazon, but evidently he feels that the latter part of his journey was too easy to make interesting reading. Certain it is that the trip up the Orinoco comprised a series of setbacks and difficulties to be overcome, combined with experiences that make one's blood curdle in the reading. It is the relation of adventures on the first of the three rivers that caught his fancy which makes Mr. Sand's narrative. In the best hotel in Manaos, Brazil, Señor Bum says goodbye as he sits down, once again Algo Sand, to the conventional North American breakfast, while he reads mail that has been collecting for nearly two years.

Lack of equipment left the author without camera or other photographic supplies during most of the time. Hence the reader must use his imagination to supplement the few photographs and fanciful illustrations that are included. Nevertheless, although the author makes no pretension to a scientific interpretation of what he sees, nor to investigate customs beyond those which concern his own progress and welfare, the geographer can glean from between the lines enough to feel that his pleasure in the book is also profit.

PRISCILLA H. WEBSTER

BROOKS, C. E. P. *Climate: A Handbook for Business Men, Students, and Travellers.* 199 pp., 3 figs. Cloth, $3.00. Charles Scribner's Sons, New York.

This concise treatment of the climates of the world is a welcome addition to the literature of climatology. It is regretted that to make it small and to cut the cost of production, figures and illustrations are almost entirely lacking. Thus, the author has had to rely on word pictures which are admirably done. Lengthy explanations are compressed to the bare essentials and the human element is entirely omitted. The choice and stress of the major features and their causes has been well treated and the book will serve its purpose as a "handbook for business men, students, and travellers." Students of climates, undoubtedly, will find it insufficient for their purposes and will seek further information elsewhere. At least, that is our hope.

The organization of the book simplifies its use for reference in most cases. The chapters deal with climatic zones modified, where necessary, by continental and political boundaries. The successive chapters are: The North Temperate Regions; "Mediterranean" Climates (southern California curiously being omitted); North Tropical Climates; Equatorial Climates; Sub-Tropical and Temperate Climates of the Southern Hemisphere; Polar Regions. For a "handbook" this arrangement is quite satisfactory.

A very commendable feature is the tables at the end of each section tabulated for ten selected stations. Each station's situation (coast, inland, island, strait, fjord, etc.), latitude, longitude, altitude (feet), and years of record is given in

addition to the essential temperatures, rainfall, cloudiness, etc. The tables are very helpful. Another favorable feature is to be found in the adequate bibliography at the end of each section.

Climatologists will thank Charles Scribner's Sons for producing this very acceptable book so cheaply.

PHIL E. CHURCH

ROUCEK, JOSEPH S., *Contemporary Roumania and Her Problems; A Study in Modern Nationalism.* Stanford University Press, Stanford University, California, 1932. Price, $4.00.

Among the most recent books dealing with European problems of Nationalism and the attempts and trials of post-war reorganization of newly-made states is Doctor Roucek's book, *Contemporary Roumania.*

Few Americans realize the political and economic inheritance of the states of Central and Eastern Europe and do not have a sympathetic understanding of the problems that European countries are facing. *Contemporary Roumania,* as it traces the political and economic history of Greater Roumania, from its early beginnings in the first century A.D. to the present, clarifies our thinking and helps the reader to understand the almost unsurmountable problems that such countries are striving to solve.

Doctor Roucek, in his volume, treats his subject comprehensively, but not too intensively, for the laymen who is interested in world politics and economics. He lifts the curtain, as it were, so the reader may understand the Roumanian problem and its relation to the wider aspects of similar world problems. Such important factors in interpreting Roumanian life as the development of the constitutional monarchy, the character and basis of Roumanian politics, the internal policies as developed from time to time, the part taken by Roumania in world politics, the dealings of Roumania with her neighbors especially those of the Little Entente, the problem of the minorities, the economic geography of the country together with a description of the very drastic agrarian reform which Roumania has well underway, the Roumanian economic policy, commercial policy and financial system as it concerns the country of Roumania and those with whom she has any dealings. Part five contains some concluding observations and a description of the educational system of the country.

One map, several pictures and many tables of worthwhile statistics, which open a valuable source of information to the student, are given throughout the final chapters.

One of the most outstanding features of the volume is the completeness of the nine-part bibliography which the author adds at the end of his book. Though not exhaustive on the subject, the bibliography is of inestimable value to one who is interested in Central European affairs of today, especially Roumanian, and wishes to do further reading on the subject.

The book is one of the most recent American publications on Roumania and anyone who is interested, as a student or layreader, in Central Europe of today can profitably spend a few hours with the book in order to receive a generalized though not intensive view of political and economic affairs as they are existent today. A better understanding of the viewpoint, taken by the Roumanian political parties in their dealings with the outside world, can be derived by reading the volume and many hazy concepts may be better formulated after a reading of Roucek's book.

M. CATHERINE ROBERTS

BEEBE, WILLIAM. *Nonsuch: Land of Water.* xv and 259 pages; 47 full-page illustrations (5 from paintings, and the rest from photographs). Published under the auspices of the New York Zoological Society by the National Travel Club, New York, 1932.

The epithet "nonesuch" fits William Beebe as to both the things he does and the way he reports them, for no book of his ever disappoints us in novelties and surprises. In this one the virile and enterprising biologist writes of his recent activities in Bermuda. *Nonsuch* we find to be an island, or rather an islet, whose situation on the outspread handful of the Bermudas, as graphically depicted in yellow against the blue of the jacket—just like a left hand partly open to the northwest—may be compared to that of a watch on your own left wrist.

In the first chapter, joining the author "in a drowned world" in a drenching rain on a fingertip of the island, you plunge with him into the darkness of the dim past, to picture Bermuda mountain rising from the timeless sea; and dipping with him into the surge you salvage a "sea bottle," a specimen of a one-celled alga, the largest single-celled organism known to man.

In another, you put on to your shoulders a diving helmet, drop below the surface and wander about "Almost Island," Beebe's submerged field of observation, where at a depth of five or six fathoms, he is as much at home as you are in your back garden. There he sits upon white sand while he watches the wonderful flounders and theorizes upon their biological and evolutional history, or takes mental notes of the fishes, now and then one new to science, that play before his eyes or above his head. And how about sharks? "I and my assistants go down . . . scores of times, and are too much enthralled . . . to give a thought to possible dangers." And on calm days he "dangles," hangs from the lower rung of the ladder as the boat above him moves slowly over the surface, allowing him to rest a foot on an up-thrust rock or coral, or to hang suspended over intervening vales and hollows.

By these and similar methods, he has won for himself an entrance to a world hitherto almost closed to man in any vivid sense, a world which he makes you see with his eyes, and from which he

brings up strange creatures and engaging speculations.

Other chapters deal with the cedars peculiar to the islands and with their petrified predecessors, one in particular within the stony base of which he found a rare sea-bird nesting, unassailably protected; with "slicking for flying fish" on calm days on the open sea; with the challenging enigmas of the migration of both birds and fishes; with the habits of visiting shore birds, nesting long-tails, and diminishing cahows, which last are going the way of the passenger pigeon and the moor-hen; with interesting traits of crabs and snail-folk; and in particular with the odd, almost vegetative, early life of the seahorse when it simulates a branch on the floating sargassum.

Intended for the intelligent layman, the book is not too technical to be forbidding, nor carelessly picturesque and sensational. You feel that the wonders presented are real and accurately reported, and you catch the ever-fresh enthusiasm of an alert, keen-eyed observer, who, in the midst of his unflagging labors, is having always a mighty good time. HOLLIS WEBSTER

JONASSON, OLOF. *Kaffet och kaffeländerna (Coffee and the Coffee-Lands)*. 446 pp., index; maps, illustrations, tables; bibliography. Kooperative Förbundets Bokförlag, Stockholm, 1932.

With painstaking accuracy and exhaustive completeness Doctor Jonasson, docent at the University of Commerce in Stockholm, has recently prepared and presented one of the most valuable and comprehensive commodity studies that has appeared in a long time. With all the discrimination of a trained geographer, he has selected and assembled all the salient information that has to do with the production, distribution, and consumption of coffee as one of the great commodities in world trade and one of the factors in international relations.

The relationship of the actual and potential areas of coffee-culture to the actual and potential occupancy by the peoples of western Europe of tropical and subtropical lands constitutes one of the intriguing features of Doctor Jonasson's research in this field of coffee and the coffee-lands. How significant the limits of coffee-production may be in determining the limits of future successful acclimatization of the white peoples in the tropics is one of the author's philosophic deductions from his studies.

Following several brief introductory chapters concerned with the discussion of natural economic regions, the history of the spread of the use of coffee as a stimulating beverage, the historical evolution of coffee culture and botanical species and varieties, Doctor Jonasson devotes the greater part of his book to thorough regional studies of present and potential coffee-producing areas, taking up in turn, Brazil, Colombia, Venezuela, Guiana, and all the rest of the coffee-producing territories of South and Central America; the Dutch East Indies, the Philippines and the rest of Asia and the Pacific Islands; Arabia, Africa, and Australia. He closes his excellent work with brief summaries of conditions limiting the distribution of coffee production; the production and consumption of coffee and its place in world trade; the most important consumption areas; tariffs and duties upon coffee; statistical tables of consumption, tariffs and tolls; the coffee requirements of Sweden; international trade; bibliography; and index.

"The cup that cheers, but does not inebriate" may be forgotten in conversation during all the rancorous debates and discussions regarding the use and abuse of alcohol, but safe it is to say that the millions who find so much comfort, solace, and social satisfaction in the morning or afternoon cup of coffee, particularly in America, Scandinavia, and Holland where most coffee is used, will find Doctor Jonasson's splendid work, *Coffee and the Coffee-Lands* interesting and indispensable. When it appears in English translation, as certainly it will, it should have a widespread sale and use, throughout all the English-speaking lands. It is "one of the books of the year" in all verity. W. ELMER EKBLAW

BATES, EDWIN. *Commercial Survey of the Pacific Northwest*. Domestic Commerce Series No. 51. U. S. Bureau of Foreign and Domestic Commerce, Washington, 1932.

This regional survey, the result of careful field study by a trained economist who has an appreciation of geographic conditions, reveals the diverse and important economic development of the Pacific Northwest. The area covered by the report embraces the states of Washington and Oregon, western Montana, and northern and southwestern Idaho, an area which, from the point of view of markets, is an economic unit. Basic principles, broad trends, and significant relationships are handled, so as to "present a descriptive and analytical study of the Pacific Northwest market with a view to interpreting the outstanding features of its market demands and the problems of wholesale and retail distribution in the several sections of that area." Such considerations as the commercial influence of the principal trading centers, the character of wholesale and retail outlets, the population and its distribution throughout the territory, sources of income of the principal trading centers, and changes which are developing in distribution methods in the principal consumer lines, are carefully worked out. Because lumber, agriculture, manufacturing, and other industries are related to the physical environment, this has been analyzed and described in these connections.

The treatment is economic rather than geographic, and leads a geographer to hope that sometime a trained geographer may make a field study in the Pacific Northwest leading to a geographic monograph on the area which will be a fitting comparison to this excellent economic analysis. HELEN M. STRONG

EDWARDS, EVERETT E. *Agriculture of the American Indians, A Classified List of Annotated Historical References with an Introduction.* Number 23 of the Bibliographical Contributions from the Library of the U. S. Department of Agriculture. 78 pages; index. May, 1932.

The geographer, as well as the anthropologist and agriculturist, will treasure this very excellent bibliography, one of the most complete yet issued. It opens up a fascinating field of research and enables the scientific explorer of factual sources to make some most interesting discoveries.

Mr. Edwards introduces the bibliography with a succinct statement of the historical importance of the subject with which the references listed are concerned. This introduction is a little gem of condensation.

Fifteen pages of titles arranged regionally follow the introduction, and they in turn are succeeded by fifteen more pages of references to publications upon the six major products—corn, cotton, maple sugar, potatoes, tobacco, and wild rice; and five upon bees, dogs, horses, and wild turkeys. Eight pages are devoted to agriculture on Indian reservations in the United States; sixteen to food and industrial plants; and five to medicinal plants. A carefully prepared, complete index ends the pamphlet.

The value of this contribution cannot be over-estimated. Those who possess it are to be congratulated; surely they must all feel grateful to Mr. Edwards for having given them this superior tool with which to work in the field covered.

W. ELMER EKBLAW

PERIODICAL ROOM
GENERAL LIBRARY
UNIV. OF MICH.

OCT 22 1932

OLUME 8 1932 NUMBER 4

ECONOMIC GEOGRAPHY

OCTOBER

AGRICULTURAL REGIONS OF NORTH AMERICA
Oliver E. Baker

NOMADIC PASTORAL REGIONS
Wellington D. Jones and Derwent S. Whittlesey

PATTERN OF COPPER MINING TERRENE OCCUPANCY IN THE SOUTH RANGE, KEWEENAW PENINSULA
Robert S. Platt

ECONOMIC ASPECTS OF THE DANUBIAN PLAN
Joseph S. Roucek

THE NORTH KANSAS CITY URBAN DISTRICT
John Q. Adams

CLARK UNIVERSITY, WORCESTER, MASSACHUSETTS, U.S.A.

OUR CONTRIBUTORS

Dr. Baker, senior agriculgural economist with the U. S. Department of Agriculture, contributes the second half of Part X of the series of articles on the "Agricultural Regions of North America." He has been in charge of the preparation of the *Atlas of American Agriculture*, and in 1923 was chairman of the Yearbook Committee of the Department of Agriculture. He is the author of several agricultural bulletins, and joint author, with Dr. V. C. Finch, of the "Geography of the World's Agriculture." His publications relative to agricultural resources and their utilization have appeared in the agricultural yearbooks, in the *Annals of American Geographers*, in the *Geographical Review*, and ECONOMIC GEOGRAPHY.

Dr. Jones, who is professor of geography at the University of Chicago, is co-author with Dr. Derwent Whittlesey of the article on "Nomadic Pastoral Regions," which appears in this issue of ECONOMIC GEOGRAPHY. During the past ten years he has devoted himself especially to developing methods of detailed field surveys of rural and urban areas. He has done considerable writing, some of his work appearing in the *Annals of the Association of American Geographers.*

Dr. Whittlesey, associate professor of geography at Harvard University, was formerly a member of the staff at the University of Chicago. He is co-author with Dr. Jones of "An Introduction to Economic Geography." Dr. Whittlesey is editor of the *Annals of the Association of American Geographers*, and has done considerable writing, his articles being listed in the *Bibliographie Geographique.*

Dr. Platt is associate professor of geography at the University of Chicago. Dr. Platt has written a number of papers in this series of pattern studies. The article which appears in this issue of ECONOMIC GEOGRAPHY is an attempt to apply the same geographic technique to copper mining as has been applied in previous studies to farming and other sorts of terrene occupancy, both rural and urban in various localities, considering these all to be parts of a world pattern.

Dr. Roucek, who is at present chairman and professor of social science at the Centenary Junior College, Hackettstown, New Jersey, is a graduate of the Czechoslovak Commercial Academy, and received his A.B. degree from Occidental College in 1925. From 1925 to 1927 he was a graduate student in political science and history at the University of California at Berkeley, and in 1928 received his Ph.D. degree from New York University. Dr. Roucek has published articles in numerous American, English, Czechoslovak, and Roumanian magazines, and his new volume, "Contemporary Roumania and Her Problems" has just come from the Stanford University Press.

Dr. Adams, who has been a member of the staff of the Department of Geography and Geology at the University of Missouri since 1923, and assistant professor since 1929, received his A.B., A.M., and Ph.D. degrees from the University of Missouri. During the summers he directs the geography work in the Summer School at the Missouri School of Mines division of the University of Missouri.

Copyright 1932
by
Clark University
Worcester, Massachusetts

(Indexes of ECONOMIC GEOGRAPHY *are issued every October for the volume just completed. The articles of the magazine are also indexed in the International Index to Periodicals to be found in every United States Library.)*

Subscribers are requested to send notices of change of address five weeks before they are to take effect. Failure to send such notice will result in the incorrect forwarding of the next copy and delay in its receipt. Old and new addresses must also be given.

ANNOUNCEMENT

THE series on the *Agricultural Regions of the World* is continued in this issue with an instalment of *Agricultural Regions of North America* by Dr. O. E. Baker. The series on *Agricultural Regions of Asia* by Dr. Samuel Van Valkenburg will be resumed in the January number. This will be followed in a later issue by *Agricultural Regions of Africa* by Homer L. Shantz, President of the University of Arizona, and will complete the finest geographic discussion of the world's agriculture thus far published.

To obtain the complete series of these extremely valuable articles, which present for the first time on such a comprehensive and accurate basis the significant divisions of the world's most important industry, it will be necessary to subscribe at once for ECONOMIC GEOGRAPHY, and to order the several back numbers.

In addition to this series of articles on agriculture, other series are being initiated; every issue will also contain four or five articles dealing with urban and regional geography, with problems of land utilization, with programs of development of resources, with commerce, with transportation, with health, and with the hundred and one other subjects that are of present geographic interest, all by the most competent and best-informed authorities in their respective fields. ECONOMIC GEOGRAPHY is indispensable to the intelligent citizen.

The subscription price to all new subscribers in the United States and possessions is $5.00 the year or $9.50 for two years. To all foreign countries, $5.50 the year or $10.00 for two years. Complete files from the beginning to include the numbers for 1932 may be obtained at the special price of $37.50 for the United States and $40.00 for all foreign countries.

ECONOMIC GEOGRAPHY

A QUARTERLY journal of ECONOMIC GEOGRAPHY published by Clark University for the benefit of geographers, economists, teachers, professional and business men, and all who are interested in the intelligent utilization of the world's resources.

Subscription rates are $5.00 the year in the United States and its Territories; $5.50 the year beyond the borders of the United States, except to charter subscribers.

Only a limited number of the first issues of ECONOMIC GEOGRAPHY are available.

The July issue of Volume 8 contains the following articles:

The Ports of Finland, Karl Kekoni, High School, Ekenäs, Finland.
Agriculture of the Southern High Plains, J. Sullivan Gibson, Western Kentucky State Teachers College.
The Banana in Caribbean Trade, Jesse T. Palmer, University of Illinois.
Iron and Steel Industry of Wheeling, West Virginia, Langdon White, Western Reserve University.
Competing Cottons and United States Production, William G. Reed, George H. McFadden & Bro., Philadelphia, Pennsylvania.
Economic Adjustments on the Olympic Peninsula, Albert L. Seeman, University of Washington.
Wild Plant Industry of the Southern Appalachians, Ina C. Yoakley, State Teachers College, Johnson City, Tennessee.

April includes:

Agricultural Regions of Asia, Samuel Van Valkenburg, College of the City of Detroit.
Manchuria: The Land and Its Economy, John R. Stewart, National Credit Office, New York.
Export Wheat Producing Regions, Helen M. Strong, Bureau of Foreign and Domestic Commerce.
Importance of Pipe Line Transportation, John K. Rose, Clark University.
Classification of North American Climates: A Review, Stephen B. Jones, Harvard University.

January includes:

Land Utilization in the Lower Rio Grande Valley of Texas, Edwin J. Foscue, Southern Methodist University.
Agricultural Vermont, S. Axel Anderson, Columbia University, and Florence Woodard, University of Vermont.
The Population of the Netherlands, J. F. Bogardus, University of Pennsylvania.
Coffee Industry of Central America, Louise Hearst, Iowa State Teachers College.
Edwards Plateau, A Combination Ranching Region, William T. Chambers, Stephen F. Austin State Teachers College.
Buffalo as a Flour Milling Center, Laura O'Day, Buffalo Museum of Science.
Dry Farming in the San Joaquin, California, Samuel N. Dicken, University of Minnesota.

The October issue of Volume 7 contains the following articles:

Agricultural Regions of North America, Oliver E. Baker, U. S. Dept. of Agriculture.
Sheep Rearing in New Zealand, R. Ogilvie Buchanan, University of London, University College.
The Significance of Drain Tile in Indiana, W. LeRoy Perkins, University of Chicago.
Economic Geography of Roumania, Joseph S. Roucek, Centenary Junior College, Hackettstown, N. J.
Fiji Sugar Industry, C. J. Robertson, International Institute of Agriculture, Rome, Italy.
Trans-Montana Routes of Colorado, Ralph H. Brown, University of Minnesota.

July includes:

Agricultural Regions of Asia, Samuel Van Valkenburg, College of the City of Detroit.
The Geography of Chosen, J. Wright Baylor, University of Cincinnati.
The Mississippi River—Asset or Liability, William H. Haas, Northwestern University.
Sheep Industry of Southeastern Ohio, Langdon White, Western Reserve University, and Clyde E. Cooper, Ohio University.
Chilean Nitrate and the Nitrate Revolution, R. H. Whitbeck, University of Wisconsin.
Iceland's Industries, S. Axel Anderson, University of Vermont.
Mechanization of Agriculture in U. S. S. R., Frances M. Earle, University of Washington.
San Luis Obispo, California, John Wesley Coulter, University of Hawaii.

April includes:

Agricultural Regions of North America, Oliver E. Baker, U. S. Dept. of Agriculture.
Our Growing System of Inland Waterways, Uthai Vincent Wilcox, Washington, D. C.
Abandoned Land in a Region of Land Abandonment, L. A. Wolfanger, Columbia University.
Geographic Areas of Cities, William T. Chambers, Stephen F. Austin State Teachers College.
Economic Adjustments in Liberia, G. T. Renner, University of Washington.
The Italian Harbors on the Adriatic Sea, Bruno F. A. Dietrich, Hochschule für Welthandel, Wien.

Single copies of back numbers of Volumes 1, 2 and 3, 1925, 1926, and 1927, will be sent to any American address for $1.75 each; to any foreign address for $2.00. Back numbers of Volume 4, 1928, Volume 5, 1929, and Volume 6, 1930, will be sent to any American address for $1.50 each; to any foreign address for $1.75. Whole volumes may be obtained at the yearly rate.

Send all subscriptions and orders to

ECONOMIC GEOGRAPHY,
Clark University, Worcester, Mass., U. S. A.

THE STAFF

WALLACE W. ATWOOD, *Editor*

W. ELMER EKBLAW, *Assistant Editor*

Associate Editors

OLIVER E. BAKER
CLARENCE F. JONES
SAMUEL J. BRANDENBURG

THE COUNCILLORS

ALBERT DEMANGEON, The University, Paris, France.
STEN DE GEER, The University, Gothenburg, Sweden.
HANS J. WEHRLI, Geographic Institute, Zurich, Switzerland.
BRUNO F. A. DIETRICH, The University, Vienna, Austria.
O. K. DAVIS, National Foreign Trade Council, New York City.
GEORGE E. ROBERTS, National City Bank, New York City.
L. A. DOWNS, Illinois Central Railroad, Chicago.
FRANK O. LOWDEN, Farmer, Oregon, Illinois.
H. G. MOULTON, Institute of Economics, Washington, D. C.
GEORGE OTIS SMITH, U. S. Geological Survey.
W. B. GREELEY, U. S. Forest Service, Washington, D. C.
HELEN M. STRONG, U. S. Department of Commerce, Washington, D. C.
M. J. PATTON, Natural Resources Intelligence Service, Dominion of Canada, Ottawa, Canada.
LAWRENCE MARTIN, Library of Congress, Washington, D. C.
ELLSWORTH HUNTINGTON, Yale University.
G. B. ROORBACH, Harvard University.
V. C. FINCH, University of Wisconsin.
K. C. MCMURRY, University of Michigan.
NELS A. BENGTSON, University of Nebraska.

"Nature has been so silent in her persistent influence over man, that the geographic factor in the equation of human development has been overlooked."

ELLEN CHURCHILL SEMPLE.

RUMFORD PRESS
CONCORD, N. H.